Institute of Energy and Mechanical Engineering named after A. Burkitbayev
Department of "Technological machines and equipment"

EDUCATIONAL PROGRAM
8D07120 «Industrial engineering »

Code and classification of the field of education	8D07 «Engineering, manufacturing and civil engineering»
Code and classification of training directions	8D071 «Engineering and engineering trades»
Group of educational programs	D103 «Mechanics and metal working»
Level based on NQF	Level 8
Level based on IQF	Level 8
Study period	3 years
Amount of credits	180

Almaty 2025

Educational program 8D07120 «Industrial engineering» was approved at the meeting of K.I. Satbayev KazNRTU Academic Council
Minutes # 17 dated «11» July 2024

was reviewed and recommended for approval at the meeting of K.I. Satbayev KazNRTU Educational and Methodological Council
Minutes # 8 dated «05» July 2024

Educational program 8D07120 «Industrial engineering» was developed by Academic committee based on direction 8D071 «Engineering and engineering trades»

Full name	Academic degree / academic title	Position	Place of work	Signature
Chairperson of Academic Committee:				
Yelemessov Kassym	Candidate of Technical Sciences, Professor	Director of the Institute of Energy and Mechanical Engineering	KazNRTU named after K.I. Satbayev	
Teaching staff:				
Kaliev Bakytzhan	Candidate of Technical Sciences, Associate Professor	Head of the department "Technological machines and equipment"	KazNRTU named after K.I. Satbayev	
Bortebayev Saiyn	Candidate of Technical Sciences,	Associate Professor	KazNRTU named after K.I. Satbayev	
Employers:				
Shakenov Aman	PhD	Chief Executive Officer	Borusan Cat Kazakhstan LLP	
Students				
Tynyshtyk Erasyl		4th year student	KazNRTU named after K.I. Satbayev	

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List of abbreviations and designations

NCJS KazNRTU named after K. I. Satbayev – NCJS «KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I. SATBAYEV»;
SOSE – State obligatory standard of education of the Republic of Kazakhstan;
Kazakhstan; EP – educational program;
IWS – independent work of a student (student, undergraduate, doctoral student);
IWST – independent work of a student with a teacher (independent work of a student (undergraduate, doctoral student) with a teacher);
WC – working curriculum;
CED – catalog of elective disciplines;
UC – university component;
CC – component of choice;
NQF – National Qualifications Framework; S
QF – Sectoral Qualifications Framework;
LO – learning outcomes;
KC – key competencies;
SDGs – Sustainable Development Goals**.**

1. Description of educational program

The Ph.D. educational program has a scientific and pedagogical orientation and involves fundamental educational, methodological and research training and in-depth study of disciplines in relevant areas of science for the system of higher and postgraduate education and the scientific field.

The educational program for the preparation of a doctor in profile assumes fundamental educational, methodological and research training and an in-depth study of disciplines in relevant areas of science for the sectors of the national economy and the social sphere: education, medicine, law, arts, economics, business administration and in the field of national security and military affairs.

Doctoral educational programs in terms of vocational training are developed on the basis of studying the experience of foreign universities and research centers that implement accredited training programs for PhD doctors or doctors in the profile.

The content of the educational program of specialized doctoral studies is established by the university itself.

The main criterion of completion of the educational process for the preparation of PhDs (PhDs) is a mastering of at least 180 academic credits by a doctoral student, including all types of educational and scientific activities.

The term of study in doctoral studies is determined by the amount of mastered academic credits. When mastering a set amount of academic credits and achieving the expected learning outcomes for a Ph.D. degree or in profile, the doctoral education program is considered fully mastered.

Training in doctoral studies is carried out on the basis of master's educational programs in two areas:

1) scientific and pedagogical with a study period of at least three years;

2) specialized with a study period of at least three years.

2. Purpose and objectives of educational program

Purpose of EP: The aim of the educational program is to prepare competitive PhDs in the field, with modern competencies and skills, techniques and technologies that contribute to solving issues arising in industry through providing in-depth theoretical knowledge and practical experience in mechanical engineering and the operation of machinery and equipment, with a focus on building sustainable infrastructure, promoting inclusive and sustainable industrialization and innovation, as well as ensuring the transition to sustainable models of industrialization and innovation.

Types of employment

Graduates of this SP can conduct the following professional activities:

- pedagogical;
- research;
- organizational and managerial;
- production and technology.

Objects of professional activity

The objects of professional activity of the OP are:

- institutions of higher and postgraduate education;
- research and design organizations;
- enterprises of the mining and metallurgical and oil and gas industry;
- enterprises for the manufacture and production of technological equipment and the organization for the maintenance of technological machines.

Tasks of EP:

to deepen the system knowledge of doctoral students, allowing them to give a critical assessment of the problems studied and discussed in the framework of modern production;

- develop skills in analyzing the designs of technological machines and equipment based on the use of modern digital technologies;
- to deepen the skills to work with modern foreign and domestic scientific literature and to give their own assessment of the events in the creation of machines and equipment;
- to expand the fluency in English necessary for writing scientific articles, reading foreign scientific literature, continuing education in foreign educational institutions, participating in international conferences and negotiations with foreign partners;
- to develop the ability to contribute to the development of the latest trends in the digitalization of technological machines and equipment through original scientific research.

3. Requirements for evaluating the educational program learning outcomes

1) have an idea:

- about the main stages of development and the change of paradigms in the evolution of science;
- about the subject, world outlook and methodological specificity of natural (social, humanitarian, economic) sciences;
- about scientific schools of the corresponding branch of knowledge, their theoretical and practical developments;
- about scientific concepts of world and Kazakhstan science in the relevant field;
- about the mechanism of implementation of scientific developments in practical activities;
- about the norms of interaction in the scientific community;
- on the pedagogical and scientific ethics of a research scientist;

2) know and understand:

- current trends, trends and patterns of development of domestic science in the context of globalization and internationalization;
- methodology of scientific knowledge;
- achievements of world and Kazakhstan science in the relevant field;
- (recognize and accept) the social responsibility of science and education;

- perfectly foreign language for scientific communication and international cooperation;

3) be able to:

- organize, plan and implement the research process;
- analyze, evaluate and compare various theoretical concepts in the field of research and draw conclusions;
- analyze and process information from various sources;
- conduct an independent scientific study, characterized by academic integrity, on the basis of modern theories and methods of analysis;
- generate their own new scientific ideas, communicate their knowledge and ideas to the scientific community, expanding the boundaries of scientific knowledge;
- choose and effectively use modern research methodology;
- plan and forecast their further professional development;

4) have skills:

- critical analysis, evaluation and comparison of various scientific theories and ideas;
- analytical and experimental research activities;
- planning and forecasting research results;
- oratory and public speaking at international scientific forums, conferences and seminars;
- scientific writing and scientific communication;
- planning, coordinating and implementing research processes;
- a systematic understanding of the field of study and demonstrate the quality and effectiveness of selected scientific methods;
- participation in scientific events, fundamental scientific domestic and international projects;
- leadership and team management;
- responsible and creative attitude to scientific and scientific-pedagogical activity;
- carrying out patent search and experience in transferring scientific information using modern information and innovative technologies;
- protection of intellectual property rights to scientific discoveries and developments;
- free communication in a foreign language;

5) be competent:

- in the field of scientific and educational activities in the context of rapid updating and growth of information flows;
- in carrying out theoretical and experimental research;
- in the formulation and solution of theoretical and applied problems in scientific research;
- in carrying out professional and comprehensive analysis of problems in the relevant field;
- in matters of interpersonal communication and human resource management;
- in matters of university training specialists;
- in the examination of scientific projects and research;
- in ensuring continuous professional growth.

4. Passport of educational program

4.1. General information

№	Field name	Comments
1	Code and classification of the field of education	8D07 «Engineering, manufacturing and civil engineering»
2	Code and classification of training directions	8D071 «Engineering and engineering trades»
3	Educational program group	D103 «Mechanics and metal working»
4	Educational program name	Industrial engineering
5	Short description of educational program	The educational program for the preparation of a Doctor of Philosophy (PhD) has a scientific and pedagogical orientation and assumes fundamental educational, methodological and research training and in-depth study of disciplines in the relevant fields of sciences for the system of higher and postgraduate education and the scientific sphere
6	Purpose of EP	The purpose of the educational program is to train competitive PhD doctors in the profile who possess modern competencies and skills, equipment and technologies that contribute to solving issues arising in industrial enterprises by providing in-depth theoretical knowledge and practical experience in the field of mechanical engineering and operation of machinery and equipment
7	Type of EP	updated
8	The level based on NQF	8
9	The level based on IQF	8
10	Distinctive features of EP	no
11	List of competencies of educational program	Communication skills Professional competencies; Research competencies; Information and communication competencies Management competencies; Creative competencies Special professional competencies
12	Learning outcomes of educational program	**LO**1: Organize, plan and implement industrial experiments, analyze, evaluate and compare research results and draw conclusions **LO**2: To know and understand modern trends, directions and patterns of development of domestic science in the context of globalization and is fluent in a foreign language for scientific communication and international cooperation **LO**3: Apply systematic knowledge in the field of theory and practice of the use of mechanization and automation of technological processes, advanced methods of analysis and diagnosis of tribotechnical processes, conduct tribotechnical tests for research purposes **LO**4: Apply systematic knowledge in the field of

		theory and practice of the use of mechanization and automation of technological processes, advanced methods of analysis and diagnosis of tribotechnical processes, conduct tribotechnical tests for research purposes **LO**5: Formulate system knowledge for independent research in the field of predictive analysis of machinery and equipment. Analyze theoretical and experimental research in order to modernize or create new methods **LO6**: Master the methods of optimizing production processes in mechanical engineering and conducting engineering experiments, optimization tools using reengineering and elements of artificial intelligence **LO7**: Analyze and predict trends in the use of laser technologies in various production processes, create conditions and requirements for their widespread introduction into production
13	Education form	full
14	Period of training	3 years
15	Amount of credits	180
16	Languages of instruction	Kazakh, Russian, English
17	Academic degree awarded	Doctor by profile (PhD)
18	Developer(s) and authors	Academic Affairs Committee

4.2. Relationship between the achievability of the formed learning outcomes based on educational program and academic disciplines

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)						
				LO1	LO 2	LO 3	LO 4	LO 5	LO6	LO7
Cycle of basic disciplines University component										
1	Methods of scientific research	Purpose: formation of knowledge about scientific research, methods and methodology of scientific research, methods of collecting, processing scientific data in modern science. Contents: structure of technical sciences, application of general scientific, philosophical and special methods of scientific research, principles of organization of scientific research, methodological features of modern science, ways of development of science and scientific research, the role of technical sciences, computer science and engineering research in theory and practice.	5	v	v		v			
2	Academic writing	Purpose: to develop academic writing skills and writing strategies among doctoral students in the fields of engineering and natural sciences. Contents: fundamentals and general principles of academic writing, including: writing effective sentences and paragraphs, writing an abstract, introduction, conclusion, discussion, conclusion, references used; in-text citation; preventing plagiarism, as well as preparing a presentation at a conference.	5	v	v					
Cycle of basic disciplines Component of choice										
3	An industrial experiment in the operation of	The purpose of mastering the discipline is to study the basics of the modern theory of industrial experiment, focused on its practical	5				v		v	

	machinery and equipment	use. The course program includes the study of methods for planning experiments, determining their number in order to obtain reliable results. Skills are acquired in using the Wilson Boxing steep climbing method. The possibilities of programs for static processing of the results of industrial experiments are being studied. Methods of plotting and empirical formulas are being mastered to obtain characteristics of reliability, tightness of connection, coefficient of variation and other indicators.								
4	Photonics in mechanical engineering	The purpose of the discipline is to acquire fundamental and applied practical knowledge in the field of photonics, laser technologies used in industry. These technologies are based on the transfer of energy or information by a stream of photons. Laser methods of processing by cutting and welding are being studied. The processes of transmission and use of light by nanomaterials, the processes of absorption, reflection and scattering of light are studied. Processing of materials with fiber lasers. The study of lasers in the processing of materials: laser cutting, laser processing, sintering, perforation, laser surface modification. Students will gain practical knowledge in conducting scientific research on laser technologies.	5				v		v	v
5	Intellectual property and the global market	Purpose: the goal is to train specialists in the field of intellectual property law who can analyze and predict trends in its development in the global market, develop strategies for the protection and commercialization of intellectual property. Contents: global aspects	5	v			v			

		of intellectual property and its role in international trade and economics, analysis of international agreements and conventions, IP management strategies, cases of protection and violation of intellectual property rights in various jurisdictions								
Cycle of profile disciplines Component of choice										
6	Complex mechanization and automation of technological processes and machines	The aim is to form a system of knowledge among students in the field of theory and practice of the use of mechanization and automation of technological processes. Summary: formation of knowledge about the theory and practice of using automation equipment and obtaining objective data on technological production and operation of machines; formation of knowledge and skills in the development and use of information technologies and machine learning capabilities in solving problems of system analysis and forecasting of the technical condition of equipment; formation of knowledge for the development of expert systems for the development of scientifically sound solutions during operation and maintenance of technological equipment.	5				v		v	v
7	Optimization solutions in production processes	The purpose of the discipline is to develop skills in the application of mathematical and computer optimization methods in the production processes of mechanical engineering. The discipline introduces mathematical optimization problems and ways to solve them, with modern SAE systems used in the design and optimization of technological	5				v		v	v

		systems and processes. The methodology of the experiment, mathematical methods of processing research results are considered. Concepts of engineering, laboratory and industrial experiment, bench research. The possibilities of artificial intelligence for solving optimization problems in the design of equipment and processes of mechanical engineering are considered.								
8	Methods of increasing reliability in the operation of machinery and equipment	The purpose of the discipline is to form a system of knowledge among students in the field of theory and practice of the use of predictive technologies in the maintenance and repair of technological equipment. Summary: formation of skills in using information technology (control systems – SCADA) in solving problems of system analysis and forecasting the technical condition of equipment; formation of knowledge about technical means of obtaining objective data on the operation of machines; formation of knowledge on the study and practical use of computer programs for analyzing data arrays, cloud services in predictive analytics technology.	5			v	v	v		
9	Tribotechnical processes in the processing of materials	The purpose of the discipline is to develop skills in the theory and practice of tribotechnical processes and their application to friction units of equipment. The discipline introduces tribotechnical processes in ensuring the required operational characteristics and reliability of equipment, with the main types and patterns of friction and wear, including in relation to specific products. The influence of	5				v		v	v

		tribotechnical processes on the characteristics of equipment, methods for determining the power, speed and other operating conditions of friction units and the choice of materials are considered.								

5. Curriculum of educational program

SATBAYEV UNIVERSITY

«УТВЕРЖДЕНО»
Решением Учёного совета
НАО «КазНИТУ им. К.Сатпаева»
Протокол № 10 от 06.03.2025

РАБОЧИЙ УЧЕБНЫЙ ПЛАН

Учебный год	2025-2026 (Осень, Весна)
Группа образовательных программ	D103 - "Механика и металлообработка"
Образовательная программа	8D07120 - "Промышленное машиностроение"
Присуждаемая академическая степень	Доктор по профилю
Форма и срок обучения	очная (профильное направление) - 3 года

Код дисциплины	Наименование дисциплин	Блок	Цикл	Общий объем в академических кредитах	Всего часов	лек/лаб/пр Аудиторные часы	в часах СРО (в том числе СРОП)	Форма контроля	Распределение аудиторных занятий по курсам и семестрам						Пререквизитность
									1 курс		2 курс		3 курс		
									1 сем	2 сем	3 сем	4 сем	5 сем	6 сем	
ЦИКЛ БАЗОВЫХ ДИСЦИПЛИН (БД)															
Модуль базовой подготовки (вузовский компонент)															
MET322	Методы научных исследований		БД, ВК	5	150	30/0/15	105	Э	5						
LNG305	Академическое письмо		БД, ВК	5	150	0/0/45	105	Э	5						
TEC319	Промышленный эксперимент в эксплуатации машин и оборудовании	1	БД, КВ	5	150	30/0/15	105	Э	5						
MSM311	Фотоника в машиностроении	1	БД, КВ	5	150	30/0/15	105	Э	5						
MNG349	Интеллектуальная собственность и мировой рынок	1	БД, КВ	5	150	30/0/15	105	Э	5						
ЦИКЛ ПРОФИЛИРУЮЩИХ ДИСЦИПЛИН (ПД)															
Модуль профильной подготовки (компонент по выбору)															
TEC320	Комплексная механизация и автоматизация технологических процессов и машин	1	ПД, КВ	5	150	30/0/15	105	Э	5						
MSM310	Оптимизационные решения в производственных процессах	1	ПД, КВ	5	150	30/0/15	105	Э	5						
TEC321	Предиктивные технологии технического обслуживания и ремонта технологических машин	2	ПД, КВ	5	150	30/0/15	105	Э	5						
MSM312	Триботехнические процессы при обработке материалов	2	ПД, КВ	5	150	30/0/15	105	Э	5						
Научно-исследовательский модуль															
AAP372	Экспериментально-исследовательская работа докторанта, включая прохождение стажировки и выполнение докторской диссертации		ЭИРД	5				О	5						
AAP376	Экспериментально-исследовательская работа докторанта, включая прохождение стажировки и выполнение докторской диссертации		ЭИРД	10				О		10					
AAP374	Экспериментально-исследовательская работа докторанта, включая прохождение стажировки и выполнение докторской диссертации		ЭИРД	30				О			30				
AAP374	Экспериментально-исследовательская работа докторанта, включая прохождение стажировки и выполнение докторской диссертации		ЭИРД	30				О				30			
AAP374	Экспериментально-исследовательская работа докторанта, включая прохождение стажировки и выполнение докторской диссертации		ЭИРД	30				О					30		
AAP375	Экспериментально-исследовательская работа докторанта, включая прохождение стажировки и выполнение докторской диссертации		ЭИРД	18				О						18	
Практико-ориентированный модуль															
AAP371	Производственная практика		ПД, ВК	20				О		20					
Модуль итоговой аттестации															
ECA325	Итоговая аттестация (написание и защита докторской диссертации)		ИА	12										12	
Итого по УНИВЕРСИТЕТУ:									30	30	30	30	30	30	
									60		**60**		**60**		

Количество кредитов за весь период обучения

		Кредиты

Код цикла	Циклы дисциплин	Обязательный компонент	Вузовский компонент	Компонент по выбору	Всего
ООД	Цикл общеобразовательных дисциплин	0	0	0	0
БД	Цикл базовых дисциплин	0	10	5	15
ПД	Цикл профилирующих дисциплин	0	20	10	30
Всего по теоретическому обучению:		**0**	**30**	**15**	**45**
НИРД	Научно-исследовательская работа докторанта				0
ЭИРД	Экспериментально-исследовательская работа докторанта				123
ИА	Итоговая аттестация				12
ИТОГО:					**180**

Решение Учебно-методического совета КазНИТУ им. К.Сатпаева. Протокол № 3 от 20.12.2024

Решение Ученого совета института. Протокол № 1 от 19.12.2024

Подписано:

Член Правления — Проректор по академическим вопросам	Ускенбаева Р. К.

Согласовано:

Vice Provost по академическому развитию	Калыпеева Ж. Б.
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