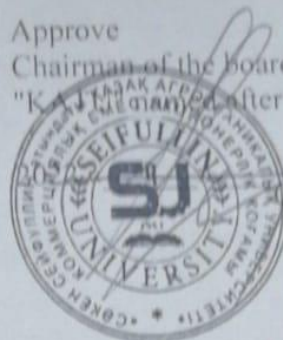


Ministry of Agriculture of the Republic of Kazakhstan
S. Seifullin Kazakh agrotechnical University

The Academic Council of the University
considered
2022 « 13 » 05
protocol № 14

Approve
Chairman of the board of JSC
"Kazakh Agrotechnical University" after S. Seifullin
K.K. Aituganov



EDUCATIONAL PROGRAM
8D07102 Heat gas supply and ventilation in agriculture

Code and classification of the field of education:

8D07 "Engineering, manufacturing and construction industries"

Code and classification of training areas:

8D071 Engineering and engineering trades

The international standard classification of education
code: 0710

Qualification: doctor of philosophy in the educational program (PhD)

8D07102 Heat gas supply and ventilation in agriculture

Training period: 3 years

Astana 2022

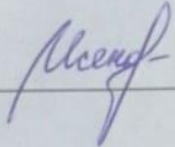
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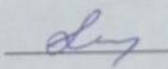
JSC named after S. Seifullin "KATU" No. 932 dated 12.12.2018, the author's team was approved by the order.

Considered at the meeting of the Department of heat power engineering,
Protocol No. 1 of "27" 08.2022

Approved by the Council of the Faculty of energy,
Protocol No. "" _____ 2022

Dean of the Faculty of energy  Isenov S.S.

Head of the department "Heat Power
Engineering"

 Mergalimova A.K.

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1 Passport of the educational program

1.1 Purpose of the educational program :

2 **The main goal** of the educational program **8 D 07102" Heat and gas supply and ventilation in agriculture "** is the creation of conditions for students to ensure the development of personal qualities and the formation of the necessary set of competencies for the implementation of professional activities, the training of a specialist capable of performing functional duties for the use and improvement of the system of heat and gas supply, ventilation, air conditioning and air purification from industrial pollution, as well as, in accordance with the requirements of employers and based on the needs of the labour market. The general goals of the educational program are specified in the following sections.

The main objectives of the educational doctoral program **"Heat and gas supply and ventilation in agriculture" :**

- provide an individual educational trajectory of learning in accordance with the specialization chosen by doctoral students ;

- 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 doctoral students in the field of heat and gas supply and ventilation in agriculture.

- train specialists with a high level of professional culture (including the culture of professional communication), who has a civil position, are able to formulate and solve modern scientific and practical problems, teach at universities, and successfully carry out research and management activities;

- to ensure the development of fundamental courses at the intersection of sciences that guarantee professional mobility;

- to ensure the acquisition of the necessary amount of knowledge in the field of university pedagogy and psychology and the acquisition of experience in teaching technical disciplines at a university.

The ultimate goal of the program is to train competitive specialists in the field of systems of heating, ventilation and air conditioning, heat and gas supply, capable of taking part in the implementation of a technological breakthrough in the economy of the Republic of Kazakhstan.

2 General characteristics of the educational program

Currently, in accordance with a number of state programs for the development of agriculture, the training of specialists in EP is very relevant. **"Heat and gas supply and ventilation in agriculture" :**

capable of performing research and practical work in heating, ventilation and air conditioning systems, heat and gas supply. At the same time, due to the high energy costs and technological backwardness of this industry, it is very important to train modern highly qualified scientific and pedagogical personnel for professional activities, in accordance with the requirements of employers and based on the needs of the labour market. The uniqueness of the educational program lies in the fact that this activity is

associated with high risks due to the operation of equipment with high parameters of the working environment (temperature, pressure) and large structures.

The modular educational program is developed in accordance with the National Qualifications Framework and is aligned with the Dublin Descriptors and the European Qualifications Framework. The educational program is designed on the basis of a modular system for studying disciplines and contains 5 modules that form general cultural and professional competencies.

The modular educational program "**Heat and gas supply and ventilation in agriculture**" provide for the study of the following cycles:

- theoretical training in cycles of basic and major disciplines;
- additional types of training: pedagogical, research practice;
- research work of a doctoral student, including the completion of a doctoral dissertation ;
- final state certification in the form of passing the state exam in the speciality and preparing and defending the final work of a doctoral student.

normative term for mastering the modular educational program for the scientific and pedagogical direction of doctoral studies is 3 years.

The labour intensity of mastering a modular educational program for doctoral students indicated in credits for the entire period of study in accordance with the State Educational Standard of the Republic of Kazakhstan in the direction of training "**Heat and gas supply and ventilation in agriculture**", including all types of classroom and independent work of the student, practice, and the time allotted for quality control in full-time education is 180 credits, including :

180 credits for the study of academic disciplines, and research practice - 20 credits, pedagogical practice - 5, doctoral research work - 115 credits, and 115 credits for final certification.

3 Competence model (portrait) of a graduate

3.1 Area of professional activity:

The area of professional activity of a doctoral student in the educational program "**Heat and gas supply and ventilation in agriculture**" is an integral part of heat engineering, which includes a set of means, methods and methods of human activity created for use in the field of heating, ventilation and air conditioning, heat and gas supply.

The subjects of professional activity of graduates of this educational program are:

- maintenance, repair of heat and gas supply and ventilation systems, heating systems;
- maintenance, and repair of small industrial and heating boilers in agriculture ;
- installation and operation of the gas supply system for industrial and agricultural enterprises;
- installation and operation of centralized and autonomous heat supply to industrial enterprises and organizations;
- maintenance, and repair of installations for the production and distribution of energy carriers in public and industrial buildings and structures ;
- maintenance, and repair of heating and heating networks;

- construction industry;
- participation in the design of heat and gas supply and ventilation systems, and heating systems.

Objects professional activities of the graduate are:

- systems of heat and gas supply, ventilation, air conditioning and air purification from industrial pollution of industrial facilities and agricultural sectors;
- systems of heat and gas supply of industrial enterprises;
- systems of heat and gas supply of autonomous objects;
- design of systems for heat and gas supply, ventilation, air conditioning and air purification of residential, public and industrial buildings and structures;
- power plants and complexes based on non-traditional and renewable energy sources;
- technological installations for the production, distribution and use of heat;
- installations for the production of compressed and liquefied gases, compressors, refrigeration and cryogenic installations, installations of air conditioning systems, and heat pumps;
- auxiliary heat engineering equipment, heat and mass transfer apparatus for various purposes;
- heating network;
- installations for conditioning heat carriers and working fluids;
- technological installations for the preparation and use of water from heating networks and heating consumers;
- water recycling systems;
- real estate objects, land plots, urban areas, transport infrastructure facilities;
- objects of urban infrastructure and housing and communal services;
- machines, equipment, technological complexes and automation systems used in the construction, operation, maintenance, repair and reconstruction of construction sites and housing and communal services, as well as in the production of building materials, products and structures.
- construction industry;
- systems of automatic control and management of heat-technological processes, installations, systems and complexes;
- regulatory and technical documentation and standardization systems, methods and means of testing equipment and quality control of products sold.

3.2 Types of professional activity:

The types of professional activity of the graduate are:

- scientific research;
- pedagogical;
- operational research;
- production and technological;
- construction;
- organizational - managerial;
- design and engineering.

3.3 General educational competencies

General educational competencies of a doctoral graduate, formed as a result of mastering the modular educational program "**Heat and gas supply and ventilation in agriculture**" :

- own culture of thinking, the ability to generalize, analyze, perceive information, set a goal and choose ways to achieve it;
- be able to logically correctly, reasonably and clearly build oral and written speech;
- be willing to cooperate with colleagues, and work in a team;
- have the ability to find organizational and managerial solutions in non-standard situations and the willingness to bear responsibility for them;
- be able to use normative legal documents in their activities;
- strive for self-development, and improvement of their qualifications and skills;
- be able to critically assess their own strengths and weaknesses, outline ways and choose means to develop strengths and eliminate weaknesses;
- be aware of the social significance of their future profession, and have a high motivation to perform professional activities;
- the ability to analyze socially significant problems and processes;
- use the basic laws of natural sciences in professional activities, apply the methods of mathematical analysis and modelling, theoretical and experimental research;
- to realize the essence and significance of information in the development of modern society; owns the main methods, ways and means of obtaining, storing, and processing information;
- have skills in working with a computer as a means of information management;
- be able to work with information in global computer networks;
- speak one of the foreign languages at a level not lower than spoken;
- own the basic methods of protecting production personnel and the population from the possible consequences of accidents, catastrophes, and natural disasters;
- own the means of independent, methodically correct use of methods of physical education and health promotion, ready to achieve the proper level of physical fitness to ensure full-fledged social and professional activities.

3.4 Core competencies

The basic competencies of a doctoral graduate formed as a result of mastering the modular educational program "**Heat and gas supply and ventilation in agriculture**" :

- conducting research and development in the field of heat and gas supply, ventilation, air conditioning and air purification from industrial pollution of industrial facilities and agricultural sectors, energy use and energy supply;
- development of plans, programs and methods for conducting tests, participating in experiments, conducting observations and measurements, and compiling their description and conclusions in the development of modernization and operation of heat and gas supply, ventilation, air conditioning and air purification systems;
- conducting a technical justification of the decisions made on the development of heat and gas supply, ventilation, air conditioning and air purification systems;
- development of mathematical and simulation models for the functioning of heat and gas supply, ventilation, air conditioning and air purification systems;

- analysis of the state and prospects for the development of gas supply and heat supply, using the necessary tools and methods;
- analysis of the state and dynamics of objects of activity;
- the creation of theoretical models that allow predicting the properties and behaviour of objects of activity;
- use of computer technologies for modelling and processing the results of experimental and theoretical studies;
- development of energy-efficient heat-technological equipment, installations and complexes;
- use of modelling and optimization methods for heat engineering processes, installations and systems;
- implementation of fundamentally new non-waste processes and complexes;
- establishing the potential and reserves of energy saving in the industries of production;
- research and implementation of low-waste and waste-free technologies;
- a study of methods for controlling the processes of heat and mass transfer, methods and apparatus for converting various types of energy into heat ;

3.5 Professional competencies

The basic competencies of a doctoral graduate, formed as a result of mastering the modular educational program "**Heat and gas supply and ventilation in agriculture**":

- development of curricula;
- writing methodological developments;
- conducting training sessions with students;
- introduction of modern forms and methods of teaching.
- organizing the work of a team of performers, making management decisions in the face of different opinions;
- finding a compromise between different requirements (to cost, quality, safety and deadlines) both in long-term and short-term planning;
- assessment of production and non-production costs to ensure a given level of product quality;
- implementation of technical control, testing and quality management in the production process.
- organization of maintenance, repair, installation and testing of equipment for heat and gas supply, ventilation, air conditioning and air purification systems;
- organization of accounting and rationing of fuel and energy resources;
- organization of calculations of production estimates, specific costs of energy resources;
- preparation of technical and economic balances of installations, technological processes, sections and the enterprise as a whole;
- energy assessment of thermal schemes and installations;
- monitoring and management of energy flows at the enterprise;
- analysis of production and financial activities of an industrial enterprise;
- organization and management of production and intellectual activities of the workforce;

- control over compliance with production and labour discipline, life safety requirements; carrying out activities for the environmental safety of the enterprise;
- organization of maintenance, repair, installation and testing of process equipment;
- making managerial decisions.

4 Base of professional practice

Doctoral students are sent to the production practice according to the agreement with the enterprises that are the base of the practice (individual agreements or collective agreements) in accordance with the order of the rector on the practice. From KATU n. S.Seifullina is assigned practice leaders for each doctoral student.

PhD students of this profile are trained in :

- "National Research Institute for Industrial Safety Problems of the Ministry of Emergency Situations of the Republic of Kazakhstan",
- Institute of Energy Research of the National Academy of Sciences of the Republic of Kazakhstan,
- Tomsk Polytechnic University,
- Warsaw University of Technology (Warsaw University of Technology),
- Moscow Power Engineering Institute (Technical University),

and also, at the department, where there is a specialized research laboratory on energy problems. On the basis of the laboratory, scientific work is carried out within the framework of priority areas - an effective solution to prioritize tasks in the field of energy.

Doctoral students also, under individual contracts, practice at any production and enterprise where there is equipment for gas supply, heat supply and heating, ventilation and air conditioning.

**5 The structure of the educational program of doctoral studies 8 D 07102
"Heat and gas supply and ventilation in agriculture" in the scientific and
pedagogical direction**

No. p / p	Name of cycles of disciplines and activities	General labour intensity	
		in academic hours	in academic credits
1	2	3	four
1.	Theoretical training	1350	45
1.1	A cycle of basic disciplines (DB)	750	25
	academic writing	150	5
	Scientific research methods	1 5 0	5
1)	University component		
	Energy saving in the heating, ventilation and air conditioning system	150	5
2)	Teaching practice	300	10
2.1	A cycle of major disciplines (PD)	600	20
1)	University component	600	20
	Resource-saving technologies based on agricultural waste	1 5 0	5
	Mathematical modelling of energy processes	150	5
2)	Research practice	300	10
2	Research work	3690	123
1)	Research work of a doctoral student, including an internship and a doctoral dissertation	3690	123
3	Additional types of training	-	-
4	final examination	360	12
	Writing and defending a doctoral dissertation	360	12
	Total	5400	180

Annexe 3 Description of the disciplines of the basic component

1. Basic information about the discipline:	
Name of the discipline	Scientific research methods
2. Number of credits	5
3. Prerequisites:	History and philosophy of science Professionally oriented language
4. Postrequisites:	Philosophical problems of technology
5. Competencies:	Mastering the basic theoretical provisions, laws, principles, terms, concepts, processes, methods , technologies, tools, and 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, and experiments.
6. Author of the course	Chairs:Thermal power engineering
7. Basic literature	Main literature: 1. Ts.R.Zaychik, B.Ts.Zaychik. History and philosophy of science and technology. M: Academic project. 2010 - 275s. 2. Stepin V.S. History and philosophy of science. M: Higher school. 2012 - 275s. 3. Shtanko V.I. Philosophy and methodology of science.Kharkiv. Phoenix Publishing. 2002 - 345s.
8. The content of the discipline. Methods of scientific research - the main attention is paid to the problems of the methodology of scientific knowledge, although considerable material has been accumulated in the practice of technical knowledge.	

1. Basic information about the discipline:	
Name of the discipline	academic writing
2. Number of credits	5
3. Prerequisites:	Professionally oriented language
4. Postrequisites:	Philosophical problems of technology
5. Competencies:	Knowledge and application of scientific research methods, modern methods of searching for scientific information on the topic of scientific research, academic writing; understanding of the meanings of the principles and culture of academic integrity.Use of computer technologies and programs for thermal calculations and processing of research results, application of methods of mathematical analysis and modelling. Possession of the skills of pedagogical activity in the disciplines of the direction of the EP, conduct training sessions with students using modern forms and methods of teaching and develop educational and methodological documentation.
6. Author of the course	Chairs:Thermal power engineering
7. Basic literature	Main literature: 1 Korotkina I. B. Academic writing: process, product and practice. Textbook for universities2015 2 Ts.R.Zaychik, B.Ts.Zaychik. History and philosophy of science and

	technology. M: Academic project. 2010 - 275s.
8. The content of the discipline.	
Development of relevant competencies among doctoral students aimed at developing the readiness and ability of scientific and pedagogical personnel to implement research projects and present results in writing in accordance with the norms of the international academic community. Acquaintance with the requirements for the design and structure of the presentation of the results of scientific research in scientific articles, dissertations, and patents.	

1. Basic information about the discipline:	
Name of the discipline	Energy saving in the heating, ventilation and air conditioning system
2. Number of credits	5
3. Prerequisites:	Special issues of fuel combustion; Thermal engineering processes and installations; The principle of operation, design and thermal calculation of boiler plants; Energy saving in thermal power engineering and heat technology, Environmental technologies for fuel combustion.
4. Postrequisites:	
5. Competencies:	<p>Knowledge of the design characteristics and operational features of heat and gas supply equipment in the agricultural industry.</p> <p>Analyze the operating modes of power supply equipment, determine the most rational parameters, and manage the quality and reliability of the functioning of heat and gas supply and ventilation systems.</p>
6. Author of the course	Department of Thermal Power Engineering
7. Basic literature	<ol style="list-style-type: none"> 1. Energy saving in heat supply, ventilation and air conditioning systems. Reference manual. - M.: Stroyizdat, 1990. - 624 p. 2. Kanaev, A. T. Introduction to nanostructural materials science. Astana : Master P o, 2018. - 232 p. 3. Borisova N.G. Energy saving and the use of non-traditional energy sources: Lecture notes. - Almaty: AIES, 2003.-76s.
8. The content of the discipline.	
Obtaining knowledge about the current state of science in the field of energy saving, innovative technologies and equipment of DHW systems about the technically possible potential, regularities and principles of operation of systems and equipment, about ways to implement energy-efficient technologies for heat supply and create a microclimate for buildings and structures based on modern equipment.	

1. Basic information about the discipline:	
Name of the discipline	Mathematical modelling of energy processes
2. Number of credits	5
3. Prerequisites:	Mathematics, Theoretical foundations of heat engineering, Physics, Chemistry.
4. Postrequisites:	Disciplines of doctoral studies
5. Competencies:	Knowledge and application of scientific research methods, modern methods of searching for scientific information on the topic of scientific research, academic writing; understanding of the meanings of the principles and culture of academic integrity. Use of computer technologies and programs for thermal calculations and processing of research results, application of methods of mathematical analysis and modelling.

6. Author of the course	Department of Thermal Power Engineering
7. Basic literature	<p>1 Baklanova O.E. "Mathematical and computer modelling". - Ust-Kamenogorsk: EKSTU, 2013. - 113 p.</p> <p>2 Baklanova O.E., Kvasov A.I., Khakimzyanov G.S., Shvets O.Ya. Fundamentals of Mathematical Modeling: Textbook. - Ust-Kamenogorsk: EKSTU, 2013. - 126 p.</p> <p>3 Weinberg M. Mathematical modelling of transport processes. Solution of nonlinear boundary value problems. 2009</p>
8. Content of the discipline	Formation of knowledge, skills and abilities of doctoral students in the application of mathematical methods for modelling and optimizing energy processes for various industrial enterprises. O mastery of methods and techniques of mathematical modelling by doctoral students; conducting a computational experiment; the use of computer technology and computer technology for research and selection of optimal options for installations and systems for such processes.

1. Basic information about the discipline:	
Name of the discipline	Resource-saving technologies based on agricultural waste
2. Number of credits	5
3. Prerequisites:	Master's disciplines
4. Postrequisites:	
5. Competencies:	Knowledge of the design characteristics and operational features of heat and gas supply equipment in the agricultural industry. Analyze the operating modes of power supply equipment, determine the most rational parameters, and manage the quality and reliability of the functioning of heat and gas supply and ventilation systems.
6. Author of the course	Department of Thermal Power Engineering
7. Basic literature	<p>1. Ksenofontov, B.S. Industrial ecology: textbook / B.S. Ksenofontov, G.P. Pavlikhin, E.N. Simakov. - M.: FORUM: Infra-M, 2013. - 208 p. - EBS "Znanium. with om."</p> <p>2. Abdrazakov, F.K. Organization of crop production with the use of resource-saving technologies: textbook / F.K. Abdrazakov, L.M. Ignatiev - M.: INFRA-M, 2015. - 112 p. - EBS "Znanium. with om."</p> <p>3. Industrial ecology: textbook / M.G. Yasoveev and others; ed. M.G. Yasoveeva. - M.: Mn.: New knowledge, 2013. - 292 p. - EBS "Znanium. with om."</p>
8. The content of the discipline.	Formation of competencies for doctoral students to introduce resource-saving, environmentally friendly and low-waste technologies into agricultural production. Familiarization of students with: types of agricultural waste, their impact on the environment, existing methods of waste disposal, and the concept of creating waste-free and low-waste agricultural production.