



Institute of «Architecture and Construction named after T.K. Basenov»

Department of «Engineering systems and networks»

EDUCATIONAL PROGRAM

8D07311 «Innovative technologies of engineering systems in industry»

Code and name of educational program

Code and classification of the field of education: **8D07 Engineering, manufacturing and civil engineering**

Code and classification of training directions: **8D073 Architecture and civil engineering**

Group of educational programs: **D127 Engineering systems and networks**

Level based on NQF: **8**

Level based on IQF: **8**

Study period: 3 years

Amount of credits: **180**

Almaty 2025

Educational program 8D07311 «Innovative technologies of engineering systems in industry» was approved

code and name of educational program

at the meeting of K.I. Satbayev KazNRTU Academic Council

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was reviewed and recommended for approval at the meeting of K.I. Satbayev KazNRTU Educational and Methodological Council.

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Educational program 8D07311 «Innovative technologies of engineering systems in industry» was

code and name of educational program

developed by Academic committee based on direction 8D073 «Architecture and civil engineering».

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List of abbreviations and designations

NJSC KazNRTU named after K.I.Satbayev - Non-profit Joint Stock Company
"Kazakh National Research Technical University named after K.I.Satpayev";
SCSE – State compulsory standard of education of the Republic of Kazakhstan;
EP – educational program;
SIS – student independent study (student, master student, doctoral student);
TSIS – independent work of a student with a teacher (student, master student, doctoral student)
WC – working curriculum;
CED – catalog of elective disciplines;
UC – university component;
CC – component of choice;
NQF – national qualifications framework;
IQF – industry qualifications framework;
LO – learning outcomes.

1. Description of educational program

The doctoral program is a professional educational program of postgraduate education aimed at training scientific personnel with the award of the degree of Doctor with a standard training period of at least 3 years. The educational program for the preparation of a Doctor involves fundamental educational, methodological and research training, and in-depth study of disciplines in the field of engineering systems of buildings and structures.

In the process of studying in the doctoral program, doctoral students can realize all the opportunities for scientific activity, in particular, they have:

- access to all library resources and electronic catalogs;
- possibility of consultations with their scientific supervisors, other professors;
- the opportunity to communicate and consult with leading scientists from many foreign universities;
- the possibility of passing an internship abroad.

The doctoral program is a professional educational program of postgraduate education aimed at training scientific personnel with the award of the degree of Doctor with a standard training period of at least 3 years.

2. Purpose and objectives of educational program

Purpose of EP: The purpose of the educational program is to train highly qualified specialists with basic competencies in the field of solving organizational and production tasks in the implementation of innovative, research projects, the formation of personnel in the field of engineering systems and networks, covering modern energy and resource-saving technologies.

Tasks of EP: The main objectives of the educational program Doctor in the profile of EP 8D07311 "Innovative technologies of engineering systems in industry" are:

- ensuring the quality of education through the presentation of mandatory requirements for the level of training of doctoral students and educational activities of higher educational institutions;
- regularization of the rights of subjects of educational activity;
- improving the objectivity and informativeness of the assessment of doctoral students' training and the quality of educational programs;
- creating conditions for academic mobility of doctoral students;
- ensuring the functioning of the unified educational space of Kazakhstan;
- ensuring the recognition of the documents of the Republic of Kazakhstan on the award of the degree of doctor in the profile in the international educational space and in the international labor market.

3. Requirements for evaluating the educational program learning outcomes

Persons who have mastered the educational program of doctoral studies and defended a doctoral dissertation, with a positive decision of the dissertation councils of a university with a special status or the Committee for Control in the Field of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan, according to the results of the examination, are awarded the degree of Doctor of in profile and a state-issued diploma with an appendix (transcript).

Persons who have received a doctor degree, in order to deepen scientific knowledge, solve scientific and applied problems on a specialized topic, perform a postdoctoral program or conduct scientific research under the guidance of a leading scientist of the chosen university.

Requirements for the key competencies of doctoral graduates:

1) Have an idea:

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

2) Know and understand:

- current trends, trends and patterns of development of Russian science in the context of globalization and internationalization;
- methodology of scientific knowledge;
- achievements of world and Kazakh science in the relevant field;
- (realize and accept) the social responsibility of science and education; – perfect foreign language for scientific communication and international cooperation;

3) Be able to:

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

4) Have the skills:

- critical analysis, evaluation and comparison of various scientific theories and ideas;
 - analytical and experimental scientific activities;
 - planning and forecasting of research results;
 - public speaking and public speaking at international scientific forums, conferences and seminars;
 - scientific writing and scientific communication;
 - planning, coordination and implementation of scientific research processes;
 - a systematic understanding of the field of study and demonstrate the quality and effectiveness of the selected scientific methods;
 - participation in scientific events, fundamental scientific domestic and international projects;
 - leadership management and team management;
 - responsible and creative attitude to scientific and pedagogical activity;
 - conducting patent search and experience in the transfer of 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 scientific-pedagogical activity in the conditions of rapid updating and growth of information flows;
 - in carrying out theoretical and experimental scientific research;
 - in the formulation and solution of theoretical and applied problems in scientific research;
 - to conduct a professional and comprehensive analysis of problems in the relevant field;
 - in matters of interpersonal communication and human resource management; – in matters of university training of specialists;
 - in the examination of scientific projects and research;
 - in ensuring continuous professional growth.

Requirements for the research and development of a student under the Doctor program:

- 1) compliance with the main problems of the educational program of the doctoral program on which the doctoral dissertation is being defended;
- 2) relevant and contains scientific novelty and practical significance;
- 3) based on modern theoretical, methodological and technological achievements of science and practice;
- 4) is based on modern methods of data processing and interpretation using computer technology;
- 5) performed using modern methods of scientific research;
- 6) contains research (methodological, practical) sections on the main protected provisions.

Requirements for the organization of practices:

The practice is conducted with the aim of developing practical skills in scientific, scientific, pedagogical and professional activities.

The educational program of the doctoral program:

- 1) research practice – for students of the doctoral program;
- 2) industrial practice – for students of the specialized doctoral program.

The doctoral student's research practice is conducted with the aim of studying the latest theoretical, methodological and technological achievements of domestic and foreign science, as well as consolidating practical skills, applying modern research methods, processing and interpreting experimental data in dissertation research.

The content of the research practice is determined by the topic of the doctoral thesis.

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	8D073 «Architecture and civil engineering»
3	Educational program group	D127 «Engineering systems and networks»
4	Educational program name	8D07311 «Innovative technologies of engineering systems in industry»
5	Short description of educational program	<p>The innovative educational program provides training of scientific personnel focused on scientific, experimental research, activities in the field of design of heat and gas supply, ventilation, water supply, sewerage, water supply and sanitation systems of settlements, industrial enterprises, water management and hydropower systems. The graduate is awarded the academic degree of Doctor.</p> <p>Doctoral students study the creation of new technologies in the field of heat and gas supply, ventilation, water supply, sewerage, hydraulic engineering and hydropower facilities.</p> <p>Much attention is paid to intellectual entrepreneurship, the development of applied projects for the real sector of the economy and the commercialization of launched projects.</p> <p>Doctoral students actively participate in research projects under the guidance of foreign consultants. Doctoral study plans include mandatory internships at leading foreign universities.</p> <p>Preparation and defense of the dissertation are conducted under the supervision of 2 scientific supervisors, domestic and foreign.</p>
6	Purpose of EP	The purpose of the educational program is to train highly qualified specialists with basic competencies in the field of solving organizational and production tasks in the implementation of innovative, research projects, the formation of personnel in the field of engineering systems and networks, covering modern energy and resource-saving technologies.
7	Type of EP	New
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	Universal, social and ethical competencies; Special and managerial competencies; Professional competencies.
12	Learning outcomes of educational program	<p>LO1 – Conduct an independent scientific study, characterized by academic integrity, based on modern theories and methods of analysis.</p> <p>LO2 – Generate their own new scientific ideas, communicate their knowledge and ideas to the</p>

		<p>scientific community, expanding the boundaries of scientific knowledge.</p> <p>LO3 – To study the achievements of world and Kazakh science in the relevant field.</p> <p>LO4 – Know the methodology of scientific knowledge. LO5 – Analyze, evaluate and compare various theoretical concepts in the field of research and draw conclusions.</p> <p>LO6 – Choose and effectively use modern research methodology.</p> <p>LO7 – Analyze and process information from various sources.</p> <p>LO8 – Plan and predict their further professional development.</p> <p>LO9 – To know the current trends, trends and patterns of development of Russian science in the context of globalization and internationalization.</p> <p>LO10 – To organize, plan and implement the research process.</p> <p>LO11 – Possess skills in economic justification and resolution of issues related to the design, operation and maintenance of engineering systems and networks, be able to analyze the results of studies of the technical condition of objects and carry out scientific and methodological work.</p>
13	Education form	Full - time
14	Period of training	3
15	Amount of credits	180
16	Languages of instruction	Kazakh, russian, english
17	Academic degree awarded	Doctor
18	Developer(s) and authors	Alimova K.K., Berdali M.N., Aliyakbarova U.H.

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	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11
Cycle of basic disciplines University component														
1	Methods of scientific research	Purpose: It consists in mastering knowledge about the laws, principles, concepts, terminology, content, specific features of the organization and management of scientific research using modern methods of scientometry. 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		v			v	
2	Academic writing	Objective: to develop academic writing skills and writing strategies for doctoral students in engineering and natural sciences. Content: fundamentals and general principles of academic writing, including writing effective sentences and paragraphs, writing an abstract, introduction, conclusion, discussion, and references; in-text citation; preventing plagiarism; and preparing a conference presentation.	5			v	v			v		v		
Cycle of basic disciplines Component of choice														

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3	Modern water supply and sewage systems	Purpose: formation of theoretical foundations for the study of modern technologies for water purification and transportation in water supply and sewerage systems Contents: regulatory documentation for the design of water supply and sewerage systems; modern designs of water intake and treatment facilities; use of modern technological equipment in systems; design of structures in difficult climatic conditions; determination of economic indicators of projects in water supply and sewerage systems.	5			✓		✓		✓	✓			✓
4	Modern ventilation systems for buildings and structures	Purpose: to study modern technologies, principles of design and operation of ventilation systems that ensure an efficient and comfortable interior space of buildings and structures. Content: Principles of designing ventilation systems for different types of buildings (residential, administrative, industrial). Regulatory requirements and standards for indoor air quality. Innovative approaches to ventilation systems.	5	✓	✓					✓	✓		✓	✓
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 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.	5			✓				✓			✓	
Cycle of profile disciplines University component														
6	Innovative design	Purpose: to study modern technologies and methods of engineering systems design aimed at improving	5			✓	✓		✓		✓	✓		✓

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	programs for engineering systems and networks	efficiency. Content: analysis and evaluation of existing engineering systems, innovative programs for engineering systems design, economic and environmental aspects of engineering systems and networks design												
7	Integrated methods for wastewater treatment in industrial enterprises	Purpose: to study modern technologies, methods and processes used for effective wastewater treatment of industrial enterprises Contents: Physico-chemical methods of wastewater treatment, legislative and environmental aspects in the field of wastewater treatment, problems and tasks of wastewater treatment at industrial enterprises, innovative methods of wastewater treatment, effective application of integrated wastewater treatment methods	5			✓	✓		✓		✓	✓		✓
Cycle of profile disciplines Component of choice														
8	Energy-saving technologies in buildings and structures	Purpose: research of energy-saving technologies in the field of heat and gas supply and ventilation. Contents: determination of energy efficiency indicators, reduction of energy consumption by systems and equipment, energy inspection of systems and networks, smart energy management and automation of systems, economic and financial mechanisms of energy saving, organization and stages of energy management	5			✓			✓		✓	✓	✓	