



**NJSC Kazakh National Research Technical University named after K.I. Satbayev
Institute of Architecture, Construction and Energy named after T.K. Bassenov
Department of "Construction and building materials"**

EDUCATIONAL PROGRAM

**"CONSTRUCTION AND PRODUCTION OF BUILDING MATERIALS AND
CONSTRUCTIONS"**

**Doctor of Philosophy PhD in the educational program "8D07302 - Construction and production
of building materials and structures"**

1st edition
in accordance with the State Educational Standard of Higher Education 2018


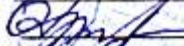

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Approved at the meeting of the Educational and methodological council of the Kazakh national research technical university named after K. I. Satpayev. Protocol №4 from 14.01.2020.

Qualifications:

Qualifications and positions are determined in accordance with the "Qualification handbook of positions of managers, specialists and other employees", approved by order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated May 21, 2012, No 201-p-m (as amended on 17. 04 .2013). Graduates of the specialty 8D07302 "Construction and production of building materials and structures" are awarded the degree of Doctor of Philosophy (PhD), doctor in the profile.

Professional competence:

The objects of professional activity of doctoral students are: - with specialized training: state and private design and engineering enterprises, industrial organizations, construction and installation organizations, organizations, and organizations of various organizational and legal forms of the construction industry. - in scientific and pedagogical training: research institutes, public and private design organizations, construction and installation organizations and enterprises, and organizations of various organizational and legal forms of the construction industry.

Brief description of the program:

The PhD doctoral program is a professional educational program of postgraduate education aimed at training scientific and pedagogical personnel with the award of the degree of Doctor of Philosophy (PhD) with a standard training period of at least 3 years. The educational program for the preparation of a Doctor of Philosophy (PhD) involves fundamental educational, methodological and research training, and in-depth study of the disciplines of the construction industry.

In the process of studying in doctoral studies, PhD doctoral students can realize all the possibilities for engaging in scientific activities, in particular, they have:

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

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

PASSPORT OF THE EDUCATIONAL PROGRAM

1 Scope and content of the program

The educational program for the preparation of a Doctor of Philosophy (PhD) has a scientific and pedagogical focus and involves fundamental educational, methodological and research training, and in-depth study of disciplines in the relevant areas of science for the system of higher and postgraduate education and the scientific sphere.

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

Educational programs for doctoral studies 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 field.

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

The main criterion for the completeness of the educational process for the preparation of doctors of philosophy (PhD) (doctor in the profile) is the 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 acquired academic credits. Upon mastering the established amount of academic credits and achieving the expected learning outcomes for obtaining a PhD or profile, the doctoral educational program is considered fully mastered.

The training of personnel in doctoral studies is carried out on the basis of educational master's programs in two directions:

- 1) scientific and pedagogical with a training period of at least three years;
- 2) specialized with a training period of at least three years.

Objectives of the educational program:

The main objectives of the educational program, Doctor of Philosophy (PhD) or Doctor of Profile in the specialty 8D07302 "Construction and production of building materials and structures" are:

- ensuring the guarantee of 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;
- streamlining the rights of subjects of educational activity;
- increasing the objectivity and information content of assessing the preparation of doctoral students and the quality of educational programs;
- creating conditions for academic mobility of doctoral students;
- ensuring the functioning of a single educational space in Kazakhstan;
- ensuring the recognition of the documents of the Republic of Kazakhstan on the award of the scientific degree doctor (PhD) or doctor in the field in the international educational space and in the international labor market.

2 Requirements for applicants

Persons with a Master's degree and work experience of at least 1 (one) year or who have

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completed residency training are admitted to doctoral studies.

Enrollment in the number of doctoral students is carried out by the admissions committees of universities and scientific organizations based on the results of the entrance exam for the groups of doctoral studies and a certificate confirming proficiency in a foreign language in accordance with the common European competences (standards) of proficiency in a foreign language.

When enrolling in universities, doctoral students independently choose an educational program from the corresponding group of educational programs.

The enrollment of persons for the targeted training of doctors of philosophy (PhD) under the state educational order is carried out on a competitive basis.

The procedure for admitting citizens to doctoral studies is established in accordance with the "Standard rules for admission to training in educational organizations that implement educational programs of postgraduate education."

The formation of the contingent of doctoral students is carried out by placing a state educational order for the training of scientific and pedagogical personnel, as well as paying for education at the expense of citizens' own funds and other sources. The state provides citizens of the Republic of Kazakhstan with the right to receive, on a competitive basis, in accordance with the state educational order, free postgraduate education, if they receive education of this level for the first time.

At the "entrance" the doctoral student must have all the prerequisites necessary for mastering the relevant professional doctoral curriculum. The list of required prerequisites is determined by the higher education institution independently.

In the absence of the necessary prerequisites, the doctoral student is allowed to master them on a paid basis. In this case, doctoral studies begin after the doctoral student has fully mastered the prerequisites.

3 Requirements for completing studies and obtaining a diploma

Persons who have mastered the educational program of doctoral studies and defended their doctoral dissertation, with a positive decision of the dissertation councils of the 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, based on the results of the examination, are awarded the degree of Doctor of Philosophy (PhD) or Doctor of Science profile and issued a state diploma with an attachment (transcript).

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

3.1 Requirements for key competencies of doctoral graduates:

1) have an idea:

- about the main stages of development and the change of paradigms 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;
- on the scientific concepts of world and Kazakh science in the relevant field;
- on the mechanism of implementation of scientific developments in practice;
- about the norms of interaction in the scientific community;
- about the pedagogical and scientific ethics of the scientist-researcher;

2) *know and understand:*

- modern trends, directions and patterns of development of domestic science in the context of globalization and internationalization;
- methodology of scientific knowledge;
- achievements of world and Kazakhstani 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:*

- 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;
- to plan and predict their further professional development;

4) *have skills:*

- critical analysis, assessment and comparison of various scientific theories and ideas;
- analytical and experimental scientific activities;
- planning and forecasting research results;
- oratory 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 leadership;
- a responsible and creative attitude to scientific and scientific-pedagogical activities;
- conducting 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 scientific-pedagogical activity in conditions of rapid renewal 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;
- in conducting a professional and comprehensive analysis of problems in the relevant area;
- 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 constant professional growth.

3.2 Requirements for the Research Work of a Doctoral student enrolled in the PhD program:

- 1) compliance with the main problems of the educational program of doctoral studies, on which

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the doctoral dissertation is defended;

- 2) is relevant and contains scientific novelty and practical significance;
- 3) is 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) carried out using modern scientific research methods;
- 6) contains research (methodological, practical) sections on the main protected provisions.

3.3 Requirements for the organization of practices:

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

The educational program of doctoral studies includes:

- 1) teaching and research practice - for students under the Ph.D. program;
- 2) industrial practice - for students under the program of specialized doctoral studies.

During the period of teaching practice, doctoral students, if necessary, are involved in conducting classes in bachelor's and master's degrees.

The research practice of a doctoral student is carried out 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 the dissertation research.

The industrial practice of a doctoral student is carried out in order to consolidate the theoretical knowledge gained in the training process and improve the professional level.

The content of research and industrial practice is determined by the topic of the doctoral dissertation.

4 Working curriculum of the educational program

4.1 Training period: 3 years

year of study	Code	Name of course	Component	Academic credits	lecture/ lab/ prac/DSIW	Prerequisites	Code	Name of course	Component	Academic credits	lecture/ laboratory/ practice	Prerequisites
1	1 semester						2 semester					
	MET321	Research methods	BD IC	6	2/0/ 1/3		AAP3 45	Doctoral student research work, including internships and doctoral dissertations	DSR W	24		
	LNG304	Academic writing	BD IC	6	2/0/ 1/3		AAP3 50	Pedagogical practice	BD	10		
	CIV300	Mathematical modeling in construction	BD IC	6	2/0/ 1/3							
	1201	Elective	PS OC	6								
	1202	Elective	PS OC	6								
	In total			30			In total			34		
2	3 semester						4 semester					
	AAP345	Doctoral student research work, including internships and doctoral dissertations	DSR W	24			AAP3 46	Doctoral student research work, including internships and doctoral dissertations	DSR W	25		
	AAP349	Research scientific training	PS	10								
	In total			34			In total			25		
3	5 semester						6 semester					
	AAP346	Doctoral student research work, including internships and doctoral dissertations	DSR W	25			AAP3 46	Doctoral student research work, including internships and doctoral dissertations	DSR W	25		
							ECA3 03	Writing and defending doctoral dissertation	FA	12		
	In total			25			In total			37		
	In all									185		

Number of credits for the whole period of study	
Cycles of disciplines	Credits
The cycle of general education	0
A cycle of basic disciplines (BD IC, BD OC)	28
A cycle of principal subjects (PS IC, PS OC)	22
All on the theoretical classes:	50
DSRW	123
Registration and defense of the master's thesis (RaDMT)	12
In total	185

THE CURRICULUM FOR MODULAR EDUCATIONAL SYSTEM

Form of study: *full*

Duration of training: 3 years

Academic degree: Ph.D

The cycle	code	Name of disciplines	Semester	Academ. credit	lec.	lab.	prac.	MSIW	Control type	Department
Profile training module										
Basic disciplines (BD) (28 credits)										
Institute component (IC)										
BD 1.1.1	LNG304	Academic writing	1	6	2	0	1	3	Exam	FL
BD 1.2.1	MET321	Research methods	1	6	2	0	1	3	Exam	MaMP
BD 1.3.1	CIV300	Mathematical modeling in construction	1	6	2	0	1	3	Exam	CEaBM
Practice-oriented module										
BD	AAP350	Pedagogical practice	2	10					Report	CEaBM
Profiling subjects (PS) (55 credits)										
Optional component (OC)										
Mathematical modeling module										
PS 2.1.1	CIV304	Modern methods of seismic protection and seismic amplification of buildings and structures	1	6	2	0	1	3	Exam	CEaBM
PS 2.1.1.1	CIV305	Methods of seismic protection of buildings and structures by Eurocodes								
PS 2.1.1.2	CIV303	Physico-chemical and physical research methods								
PS 2.2.1	CIV307	Design and construction in difficult engineering and geological conditions	1	6	2	0	1	3	Exam	CEaBM
PS 2.2.1.1	CIV312	Modern technologies in the construction industry								
PS 2.2.1.2	CIV309	Study of building materials for environmental friendliness and flammability								
Practice-oriented module										
PS	AAP349	Research scientific training	3	10					Report	CEaBM
Research module (123 credits)										
DSRW	AAP345	Doctoral student research work, including internships and doctoral dissertations	2,3	48					Report	CEaBM
DSRW	AAP346	Doctoral student research work, including internships and doctoral dissertations	4,5,6	45					Report	CEaBM
Final certification module (12 credits)										
FA	ECA303	Writing and defending doctoral dissertation	6	12					Defense of dissertations	
Total credits				185						

5 Descriptors of the level and amount of knowledge, abilities, skills and competencies

The third level descriptors within the Comprehensive Qualifications Framework of the European Higher Education Area (EC-EHEA) reflect learning outcomes that characterize the student's abilities:

- 1) demonstrate a systematic understanding of the field of study, mastering the skills and research methods used in this area of the construction industry;
- 2) Demonstrate the ability to think, design, implement and adapt an essential research process with a scientific approach;
- 3) contribute with their own original research to expand the boundaries of the scientific field that deserves publication at the national or international level;
- 4) critically analyze, evaluate and synthesize new and complex ideas;
- 5) communicate their knowledge and achievements to colleagues, the scientific community and the general public;
- 6) to promote, in an academic and professional context, the technological, social or cultural development of a knowledge-based society.

6 ECTS Diploma Supplement

The application was developed according to the standards of the European Commission, Council of Europe and UNESCO / CEPES. This document is for academic recognition only and is not an official proof of education. Not valid without a university degree. The purpose of completing the European Annex is to provide sufficient information about the holder of the diploma, the qualification obtained, the level of this qualification, the content of the study program, the results, the functional purpose of the qualification, as well as information about the national education system. The application model that will be used to translate grades uses the European Credit Transfer or Transfer System (ECTS).

The European Diploma Supplement provides an opportunity to continue education at foreign universities, as well as to confirm national higher education for foreign employers. When going abroad for professional recognition, additional legalization of the educational diploma is required. The European Diploma Supplement is completed in English upon individual request and is issued free of charge.

Academic writing

THE CODE - LNG304
 CREDIT –6

The purpose of the course is to develop skills and competencies in the field of research and the formation of skills for writing qualifying theses. The study of the discipline is based on the development and improvement of skills in the field of written scientific and methodological relations, necessary for effective communication in the scientific and academic environment, providing a high level of training for doctoral students.

The objectives of the discipline are to familiarize doctoral students with the basic requirements for writing in a scientific language.; formation of skills to Express motivated ideas and opinions in writing using professional vocabulary and terminology; development of text editing skills; training in ways to correctly and logically build the structure of scientific research; preparation for writing articles, scientific papers and annotations; learning ways to freely and motivated presentation of thoughts on a scientific and professional problem.

Research methods

THE CODE - MET321
 CREDIT –6

The training course allows you to gain knowledge on the basic theoretical principles, technologies, operations, practical methods and techniques for conducting scientific research based on the modern achievements of domestic and foreign scientists and master the skills of choosing the topic of scientific research, scientific search, analysis, experimentation, data processing, obtaining valid effective solutions using information technology.

The course includes: the concept of science and research, research methods and methodology, methods for collecting and processing scientific data, principles for organizing research, methodological features of modern science (differentiation, integration, a systematic approach, abstraction, concretization, synergetic paradigm, evolutionism , logic, instrumental analysis, etc.), the development of science and research, the role of technical sciences, informatics and engineering research in modern science, the structure of technical sciences, the application of general scientific, philosophical and special methods (including marketing and investment) of scientific research in theory and practice.

Mathematical modeling in construction

THE CODE - CIV300
 CREDIT –6

Approaches to the application of mathematics to solving practical engineering problems are presented. In recent decades, these approaches have acquired the clear features of technology, as a rule, focused on the use of computers. The discipline examines step-by-step actions in mathematical modeling, from the formulation of a practical problem to the interpretation of the results of its solution obtained mathematically.

The traditional engineering areas of mathematical applications that are most in demand in construction practice are considered: problems of theoretical mechanics and mechanics of a deformable solid, problems of heat conduction, fluid mechanics and some simple technological and economic problems.

Physico-chemical and physical research methods

THE CODE - CIV303

CREDIT - 6

The purpose of the discipline "Physicochemical and physical research methods" is to study the foundations of the theory and practice of physical and chemical analysis of substances, the main experimental laws underlying physical and chemical research methods, their connection with modern technologies, as well as the formation of competencies among doctoral candidates that allow carry out the identification of organic compounds based on the data of various physical methods for studying molecules.

The tasks of the discipline include the formation of basic knowledge and ideas about the fundamental laws and basic methods of studying the physical and chemical properties and structure of substances, as well as mastering the methodology of the basic methods of physical research.

Study of building materials for environmental friendliness and flammability

THE CODE – CIV309

CREDIT - 6

The discipline examines the issues of environmental friendliness and combustibility of modern building materials used in construction. Environmental research methods. Features of the experimental determination of flammability. Toxicity of combustion products of building materials. Improved methods for determining the flammability of building materials.

Modern technologies in the construction industry

THE CODE – CIV312

CREDIT - 6

The purpose of teaching this discipline is to form a system knowledge and skills in the field of construction of buildings, structures and related engineering infrastructure based on the use of modern building technologies that implement a variety of architectural and engineering solutions using efficient materials designs and equipment, modern technical equipment, progressive organization of labor of workers.

Modern methods of seismic protection and seismic reinforcement of buildings and structures

THE CODE - CIV304

CREDIT - 6

The discipline studies the most progressive solutions for earthquake-resistant residential and public buildings of mass development. An overview of the most economical methods of active seismic protection of buildings and structures used in Kazakhstan and abroad is given. Methods for calculating and designing systems with sliding belts, dynamic vibration dampers, including couplings, and their economic efficiency are described. Examples of calculations of buildings with both passive and active methods of seismic protection of buildings from earthquakes are proposed.

Design and construction in difficult engineering and geological conditions

THE CODE - CIV307

CREDIT - 6

The purpose of the discipline is to form a general understanding of the design of buildings and structures in complex engineering and mining-geological conditions, familiarization with all types of complex engineering-geological conditions, the interaction of the system "structure-foundation-unevenly deformable base" and methods of protecting buildings and structures in complex conditions.

Tasks: familiarization with the classification of complex engineering and geological conditions; additional deformations of the base, which arise depending on the type of complex engineering and geological conditions, and their deformation effect on buildings and structures; features of the calculation and design of foundations and foundations in the conditions under consideration; methods of protecting buildings and structures in complex engineering and geological conditions

Writing and defending doctoral dissertation

THE CODE - ECA303

The purpose of the doctoral dissertation is to assess the scientific-theoretical and research-analytical level of the doctoral student, the formed professional and managerial competencies, the readiness to independently perform professional tasks and the compliance of its preparation with the requirements of the professional standard and the educational program of doctoral studies.

SHORT DESCRIPTION

Doctoral dissertation is a scientific work of a doctoral student, which is an independent research, in which theoretical provisions are developed, the totality of which can be qualified as a new scientific achievement, or a scientific problem is solved, or scientifically grounded technical, economic or technological solutions are stated, the implementation of which makes a significant contribution to development the country's economy.

A doctoral dissertation is the result of the research / experimental research work of a doctoral student, carried out during the entire period of study of a doctoral student.

The defense of a doctoral dissertation is the final stage of the master's preparation.

A master's thesis must meet the following requirements:

- The topic of the dissertation should be related to priority areas of development of science and / or government programs or programs of fundamental or applied research.
- The content of the thesis, the goals and objectives, the scientific results obtained must strictly correspond to the topic of the thesis.
- The dissertation is carried out in compliance with the principles of independence, internal unity, scientific novelty, reliability and practical value.

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