

NON-PROFIT JOINT-STOCK COMPANY "KAZAKH NATIONAL RESEARCH TECHNICAL  
UNIVERSITY named after K.I. SATPAYEV"



Institute of Architecture and Construction named after T.K. Basenov  
Department of "Construction and Building Materials"

**GRADUATE MODEL**  
Bachelor`s degree program  
**6B07312 - " Innovative production of building materials "**

Almaty 2024

## 1. Description of the educational program

The educational program "Innovative production of building materials" is developed in accordance with the National Qualifications Framework, professional standards and aligned with the Dublin descriptors and the European Qualifications Framework. The educational program is focused on learning outcomes.

Dublin descriptors, which are a description of the level and scope of knowledge, skills, abilities and competencies acquired by students upon completion of the educational program of each level (stage) of higher and postgraduate education, are based on learning outcomes, competencies formed, as well as the total number of ECTS credit (credit) units.

The educational program "Innovative production of construction materials" is aimed at training highly qualified, competent specialists capable of organizing the activities of industrial and production units of enterprises of the construction industry, road and road construction. The program, on the one hand, is based on centuries-old experience in the production of building materials and products, on the other hand, motivates graduates for creative participation and initiative in the development of new, modern methods of production of innovative building materials, including the use of nanostructuring additives.

The educational program trains on four educational trajectories, according to the Atlas of new professions and competences of the RK:

- Engineering-technologist - Environmental Building Materials Engineer, develops technologies to produce cost-effective, environmentally friendly building materials from renewable natural resources; recyclable. Develops characteristics of building materials that will enable their further recycling, with the production of materials from renewable resources.

- Engineer-technologist - for construction waste processing, analyzes morphological composition of construction waste (determines what components construction waste consists of) and analyzes chemical composition of a particular waste component. Based on the results of the data analysis, he selects appropriate technologies for waste recovery or recycling. This specialist understands the technologies of recycling construction waste generated in the course of new construction, during major repairs and reconstruction of buildings, defects in the production of building materials and products;

- Advanced Concrete and Reinforced Concrete Products Manufacturing Engineer - improve existing and develop new technologies for the production of concrete and reinforced concrete products. Develop measures to reduce labor intensity and speed up production processes.

- The Construction Innovation Manager understands the technological innovations available on the market and ready to be implemented in the construction industry. Taking into account the goals of the client and its customers, the innovation manager investigates the possibility and recommends specific new technologies and materials that can be used in the realization of a construction project. The innovation manager's expert opinion is taken into account throughout the entire life cycle of the construction project (design, construction, operation, demolition/demolition).

Graduates of the educational program acquire skills to master and develop new technologies and equipment used in the production of building materials, products and

structures. This is facilitated by the inclusion in the program of projects on modules, forming, along with professional competencies, the ability to work in a team and the development of the necessary leadership skills.

Fundamental training in natural sciences and general engineering disciplines allows continuing education in engineering master's degree programs. The main teaching staff of the educational program has academic degrees and titles, some teachers are working engineers and designers, solving real production problems in the field of development of new highly effective technologies, processes and equipment for the production of building materials, products and structures.

## **2 Awareness and formulation of the basic goals (objectives) of the educational program (EP) 6B07312 - "Innovative production of building materials"**

### **2.1 Objectives of the Bachelor's degree program**

Preparation of competent, highly qualified specialists capable of organizing the production of modern building materials, products and structures for the construction industry, and road and highway construction. The training is completed by awarding the degree "Bachelor of Engineering and Technology".

### **2.2 Educational Program Objectives:**

1. Study of the cycle of general education disciplines to provide social and humanitarian education based on the laws of socio-economic development of society, history, modern information technologies, state language, foreign and Russian languages.

2. Study of the cycle of basic disciplines to ensure knowledge of natural science, general technical and economic disciplines as the foundation of professional education.

3. Study of the cycle of profiling disciplines for the formation of theoretical knowledge, practical skills and abilities in the field of production of modern building materials, products and structures.

4. Study of disciplines that form knowledge, skills and abilities to plan and organize research, design technological schemes of production of modern building materials, products and structures, including the use of modern computer technologies and programs.

5. Familiarization with potentially hazardous processes and equipment of industrial facilities during practical training.

6. Acquisition of skills for assessment of working conditions at production facilities for preparation of regulatory documentation and all types of reporting on their certification.

## **3 Requirements for assessing the learning outcomes of the educational program**

Description of the general prerequisites for graduation with a Bachelor of Science degree in Engineering and Technology: completion of at least 240 academic credits of theoretical study and a final thesis.

Descriptors of the level and scope of knowledge, skills, abilities and competencies

A – knowledge and understanding:

- A1 - Demonstrate knowledge and understanding at a professional level;
- A2 - Communicate their findings and knowledge clearly and concisely;
- A3 - Strive to acquire the most advanced knowledge in the profession.

B – application of knowledge and understanding:

- B1 - Independent development and promotion of various options for solving professional problems with the application of theoretical and practical knowledge;
- B2 - Apply knowledge to solve new or unfamiliar situations;
- B3 - Ability to solve problems within broader interdisciplinary areas related to professional practice.

C – judgment formation:

- C1 - Collect necessary information;
- C2 - Be able to interpret information to form judgments with social, ethical, and professional-scientific considerations;
- C3 - Make judgments based on incomplete or partial information.

D – personal abilities:

- D1 - Readiness for social mobility;
- D2 - Readiness to adapt to new situations, reassess accumulated experience;
- D3 - Ability to learn independently.

B – Basic knowledge, skills and abilities

- B1 - To possess basic knowledge in the field of natural science (social, humanities, economics) disciplines, contributing to the formation of a highly educated person with a broad outlook and culture of thinking;
- B2 - possess the skills of using information technologies in the sphere of production of modern building materials, products and structures;
- B3 - possess the skills of acquiring new knowledge necessary for professional activity and continuing education in Master's program.

II – Professional competencies, including as required by industry professional standards:

- II1 - Able to logically present mastered knowledge and understanding of systemic interrelationships within disciplines, as well as interdisciplinary relationships in modern science.
- II2 - Able to build learning technologies in a new way.
- II3 - Possession of approaches and methods of critical analysis, ability to practically use them in relation to various forms and processes of modern life of society.
- II4 - Willingness to work independently, ability to manage your time, plan and organize activities.
- II5 - Readiness for continuous self-development, ability to build strategies for personal and professional learning development.
- II6 - Able to determine the modes of operation of mechanical, technological and heat

and humidity equipment of construction industry enterprises.

П7 - Able to calculate and select mechanical, process and heat and humidity equipment for the construction industry.

П8 - Able to properly and safely operate various equipment for the production of modern building materials, products and structures.

П9 - Able to independently master new techniques, technological and technical documentation.

П10 - Able to make technical and economic comparisons of various options for the design of industrial buildings and technological schemes for the production of modern building materials, products and structures.

П11 - Skills in designing an industrial building (plant, workshop) and technological schemes for the production of modern building materials, products and structures.

П12 - Knowledge of the requirements of Health, Safety and Environment Regulations and the ability to use them in practice.

П13 - To speak professional Kazakh, Russian and one of the common foreign languages.

П14 - Knowledge of energy- and resource-saving technologies and ability to apply them in the production of modern building materials, products and structures, as well as in the utilization of construction waste.

#### O - General human, social and ethical competencies

O1 - To know the history of the Republic of Kazakhstan, stages of development of the state and prospects.

O2 - Ability to use modern information technology to access information sources.

O3 - To speak the state language, Russian and one of the common foreign languages at a level that ensures human communication.

O4 - Understanding and practical use of healthy lifestyle norms, including prevention, the ability to use physical education to optimize performance.

O5 - Knowledge and understanding of his/her rights and duties as a citizen of the Republic of Kazakhstan.

O6 - Understanding the values of culture, science and production.

O7 - Knowledge and understanding of professional ethical norms, mastery of professional communication techniques.

O8 - Ability to build interpersonal relationships and work in a group (team).

O9 - Awareness of project management and business, fundamentals of micro and macro economics, knowledge and understanding of risk in a changing environment.

O10 - Recognizing the need and acquiring the ability to learn and improve their skills independently throughout their working life.

O11 - Ability to use energy- and resource-saving technologies.

O12 - Ability to practically use the fundamentals and methods of mathematics, physics and chemistry.

O13 - To know and master the basics of organization of production of construction materials and recycling of construction waste, and operation of products and structures.

O14 - Know and master the basic business processes in the enterprise.

#### C – Specific and managerial competencies

C1 - have skills of professional communication and intercultural communication, public speaking, correct and logical presentation of their thoughts in oral and written form.

C2 - be able to economically justify and solve the issues related to the organization of the production process, determine the volumetric and qualitative indicators of building materials, products and structures., process and analyze the obtained results of theoretical and experimental research on the technical level and operational condition of products and structures made of modern building materials or recycled materials.

C3 - possess the skills of risk management using traditional and modern technologies on the basis of application of methodology of building models of risk representation in the sphere of building materials production, analysis and comparison of risk alternatives; be able to freely navigate in applied works on analysis and risk management in supply chains, manage conflicts and know business ethics.

C4 - be able to make qualified independent decisions on the basis of acquired knowledge for subsequent practical justifications aimed at improving the functioning of various production lines of building materials, products and structures.

C5 - be capable of making optimal management decisions in various conditions, possess knowledge of the latest theoretical, methodological and technological achievements of domestic and foreign science, modern methods of scientific research, processing and interpretation of experimental data.

C6 - possess the skills to acquire new knowledge, expand and deepen knowledge necessary for daily professional activities and continuing education in doctoral studies, be capable of self-improvement and personal growth.

#### **4. Learning outcomes of the educational program and the matrix of correlation of learning outcomes of the educational program as a whole with the formed competences**

PO1 - To possess basic knowledge in the field of natural science disciplines, contributing to the solution of professional problems in the field of production of construction materials and recycling of construction waste and the formation of a highly educated person with a broad outlook.

PO2 – To possess methods and means of physical and mathematical (computer) modeling, including the use of universal and specialized software and computer complexes to solve technological problems in the field of production of building materials, products and structures.

PO3 – To know the trends of development and importance in technological schemes of application programs, methods of construction of plane projection models of three-dimensional space.

PO4 – To master the regulatory framework in the field of building surveys, layout, development and principles of design of industrial facilities for the production of modern building materials, products and structures.

PO5 – Be able to maintain documentation on quality management and methods of research, production and processing of building materials, products and structures, know the requirements of labor protection and basics of environmental safety in

professional activities.

PO6 – To know the rules and technologies of installation, adjustment, testing and commissioning of mechanical, process and heat and humidity equipment and other installations for industrial plants, and construction industry enterprises.

PO7 – Possess the methods of engineering calculations, apply them to solve specific technological problems, bring for discussion and be able to defend the accepted options on specific professional issues.

PO8 – Be able to apply a system of fundamental knowledge (mathematical, natural science, engineering and economics) to identify, formulate and solve technological problems.

PO9 – To be able to rationally choose mechanical, technological and heat and humidity installations in accordance with their purpose, taking into account economic requirements and environmental safety.

PO10 – To possess knowledge of the basics of manufacturing and production of building materials, products and structures, as well as recycling of construction waste. Possess the skills of technological calculation.

PO11 – Possess knowledge of the regulatory framework in the field of production of building materials, products and structures, as well as recycling of construction waste, taking into account innovative technologies.

PO12 – To possess normative-legal, economic and organizational knowledge in conducting business activities in the conditions of Kazakhstan economy. To know professional ethics, codes of ethics, generally accepted rules of doing business. Know the concept, content and types of corruption.

PO13 – To form a systemic knowledge of the basics of organization and responsibility of business entities. To master the norms of international law on corruption. To develop organizational and managerial skills in conducting entrepreneurial activities.

**Head of Department**  
**"Construction and building materials"**

**D.A. Akhmetov**

Considered at the meeting of the department  
Protocol No. 12 of 10.01.2023