N-PJSC "KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY NAMED AFTER K.I. SATPAYEV"

GRADUATE MODEL (BACHELOR)
Educational programs

6B07311 - «BIM design and construction management»
(B074 Urban planning, construction works and civil engineering)

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Content

Introduction

The specialist's model should be systemic in nature, reflect the advantages of qualification and competence approaches.

In the competence model of a specialist, the goals of education are associated not only with the performance of specific functions, but also with integrated requirements for the outcome of the educational process. The competence approach covers, along with specific knowledge and skills, categories such as the ability and willingness to learn, social skills, etc.

Modern conditions in the field of Urban planning, construction works and civil engineering in the direction of civil engineering impose new requirements on graduates, among which the need for systemically organized, intellectual, communicative, self-organizing principles is gaining increasing priority.

The quality of bachelor's professional training in the field of civil engineering depends on the degree of validity of three main points:

• Goals and objectives of the educational program.

• The content of the training.

• Principles of the educational process organization.

Taking into account the opinion of potential consumers and the association of graduates of KazNITU named after K.I.Satpayev, in accordance with the mission of the University and the requirements of the State Mandatory Standard of Education of the Republic of Kazakhstan, the goals and objectives of the educational program of the specialty 6B07311 - «BIM design and construction management» were formulated.

The content of the training should meet the requirements of the current level of development of the civil engineering direction, mastered by the bachelor throughout the entire period of study.

The competence matrix is a tool for determining the minimum abilities of a bachelor of the educational program of specialty 6B07311 - «BIM design and construction management».

The structure of the matrix allows you to evaluate the minimum competence necessary for the entire career growth. The matrix is necessary for the approval of future industrial standards and can be used by companies to assess the requirements for their personnel.

The model of a specialist in the field of Urban planning, construction works and civil engineering provides for:

- competencies due to the development of modern science and technology;
- competencies dictated by the requirements of the profession, specialty;
- competencies determined by the socio-political system of the country, its spiritual and moral system.

The model of a specialist in the field of civil engineering has historically been embodied in various forms, starting with qualification characteristics and ending with professionograms.

To acquire a set of professional, intercultural, communicative competencies, a graduate of EP 6B07311 - «BIM design and construction management» must master the knowledge of a set of general education (OOD), basic (DB) and profile (PD) disciplines, both in terms of the mandatory component and the component of choice in full, established by the state standard.

Of great importance in the modern world is the ability to navigate the information flow: the ability to find and systematize various sources of information according to a certain criterion; use rational methods of obtaining, converting, systematizing and storing information, actualize it in the necessary situations of intellectual and cognitive activity, as well as computer literacy, mastery of new information and multimedia technologies, the ability to critically evaluation of information.

1 Goals and objectives of the educational program 6B07311 - « BIM design and construction management»

Purpose: The purpose of the educational program is to train practice-oriented specialists of a new generation with theoretical and practical knowledge, skills and abilities of BIM design and management necessary for their implementation in professional activities, meeting the needs of domestic and global intellectual labor markets, ready to improve the quality of engineering surveys, design and construction.

A graduate in the field of BIM design and construction management should be ready for:

- organizational activities that exclude negative phenomena in professional activity, the development of spiritual values, moral and ethical norms of a person as a member of society, the implementation of the legal and legislative system of the Republic of Kazakhstan with a high level of professional culture, civic position;
- activities for continuous self-improvement and self-development, mastering new knowledge, skills and abilities in innovative areas of BIM design and construction management;
- acquisition of knowledge of the regulatory framework in the field of engineering surveys, principles of design of buildings, structures, engineering systems and equipment, planning and development of settlements;
- competitiveness in the field of construction by increasing competence in the field of advanced construction technologies.

2 List of qualifications and positions

The graduate of the Bachelor's degree in OP 6B07311 - "BIM design and construction Management" is awarded the academic degree of Bachelor of Engineering and Technology.

Qualifications and positions are determined in accordance with the National Qualifications Framework (NQF), approved by the protocol of March 16, 2016 by the Republican Tripartite Commission on Social Partnership and Regulation of Social and Labor Relations.

A graduate who has mastered the program in the field of training, in accordance with the types of professional activity, is ready to solve the following professional tasks:

- To know modern trends in the development of computer graphics, methods of geometric modeling modules, axonometric projection, to make working drawings and sketches of elements using modern software systems AutoCAD, Revit for the design of building structures of any complexity.
- Have knowledge in the field of building materials, engineering surveys, principles of design of buildings and structures, planning and development of settlements;
- To know the basics of theoretical knowledge and practical skills in designing, calculating and building water supply, sewerage, gas supply, heat supply of settlements and creating their BIM model;
- To know the modern requirements of BIM design of space-planning and structural solutions for energy-efficient buildings, the main factors determining the shape and functional and spatial structure of buildings, ways to reduce energy consumption of existing buildings and structures, the use of non-traditional energy sources, the model of interaction between climate and the internal environment of buildings is analyzed;
- Be able to rationally choose building and structural systems of buildings in accordance with the purpose of the object, its spatial planning solution, economic feasibility, energy efficiency and environmental safety;
- Possess the skills of designing, calculating and constructing reinforced concrete and metal structures of a system of buildings and structures, taking into account the seismic resistance of structures, to calculate and design their elements using modern software systems adapted from EN and BIM;
- Possess modern methods of calculation, design and installation of foundations, foundations of buildings and underground structures and create a BIM base for monitoring the behavior of a geotechnical object;
- To know the basis of economics and management in construction, cost classification, methods of accounting and determining the cost of construction products (building parts, works, services), planning and management of construction based on BIM.

Types of professional activity

Bachelors of OP 6B07311 - "BIM design and construction management" can perform the following types of professional activities:

- Organizational and managerial;
- Calculation, design and analytical.

3 Descriptors

The field of professional activity may include the following industries: construction of industrial and civil buildings, facilities of the oil and gas sector, chemical industry, etc.

The objects of professional activity are: design and survey, research institutes, technical supervision bodies in the field of urban planning and housing and communal services, entrepreneurial activity and management of industrial, construction and housing and communal companies, etc.

The subjects of professional activity are the design, construction, operation, evaluation and reconstruction of buildings and structures; planning, organization and coordination of construction management at various stages and stages of the object's life cycle.

Bachelor's Degree structure

4 General competencies

4.1 Social and humanitarian

Knowledge of the laws of socio-economic development of society, the history of Kazakhstan, the state language, foreign and Russian languages as means of interethnic communication.

Understanding the importance of their social functions as a citizen of their country, a member of society, a stable positive attitude to their public duties.

Knowledge of the symbols of the state (coat of arms, flag, anthem). Knowledge of human and civil rights and freedoms, the ability to implement them in various life situations. The ability to correlate their interests with the interests of society. The focus on the improvement and development of society based on the principles of humanism, freedom and democracy. Experience of socially useful civic activity. The presence of a certain life position and internal readiness for its implementation. The ability to take responsibility, participate in the functioning and improvement of democratic institutions. The need for self-development.

Knowledge and compliance with the norms of a healthy lifestyle, physical culture of a person, freedom and responsibility of lifestyle choice.

The graduate must have a culture of thinking, know its general laws, be able to correctly and logically formalize the results in written and oral speech. Knowledge and observance of traditions, ritual, etiquette. The ability to engage in constructive communication and observe its optimal duration; the ability to conduct a civilized dialogue. Knowledge of constructive ways to resolve the conflict and correct broken relationships. Critical attitude towards yourself and your interlocutor, the ability to admit your mistakes and your rightness in time.

Public speaking and writing skills, foreign language communication. Experience of interaction with various people (by age, status, occupation), the ability to build partnerships, the ability to work in a team, organize the work of performers, find and make managerial decisions.

A graduate should know the ethical and legal norms governing the attitude of a person to a person, society, and the environment.

4.2 Economic, organizational and managerial

The graduate must know the basics of industrial relations and management principles, taking into account technical, financial and human factors, must master the basics of economic analysis and be ready to perform organizational and managerial functions in a team.

4.3 General scientific

The provision of in-depth knowledge of a natural science, general technical nature as the foundation of professional education is provided by the study of disciplines: mathematics, physics, engineering and computer graphics.

Information competence should also be attributed to general scientific ones: knowledge of modern information and multimedia technologies, the ability to work with a large amount of data using Autodesk Revit and AutoCAD equipment and tools. Skills of coordination of joint work (a single model, links between sections) of construction participants, starting from customers to the maintenance team. The ability to support and develop a unified engineering data management system (UMS) based on three-dimensional CAD models and PDM systems.

4.4 General technical

The bachelor must be competent in all matters related to the construction stages and the creation of BIM models.

Competencies are provided by studying the following disciplines: information and communication technologies, ecology and sustainable development, life safety, engineering and computer graphics.

The professional capabilities of a bachelor in modern conditions must meet the requirements of the global international labor market. A bachelor should be ready to change social, economic, and professional roles, and should be geographically and socially mobile in the face of the increasing dynamism of change and uncertainty.

5. Professional competencies

The purpose of the cycle of core disciplines (PD) is to master the key theoretical aspects of methodology, techniques and technologies in the field of construction to solve professional problems of production and technological activities, organizational and managerial activities, design and survey activities:

– the ability to use the basic laws of natural science disciplines in professional activities, apply methods of mathematical analysis and mathematical (computer) modeling, theoretical and experimental research;

- knowledge of the basic laws of geometric formation, construction and mutual intersection of plane and space models, necessary for performing and reading drawings of buildings, structures, structures, drawing up design documentation and details;

- the ability to use regulatory legal documents in professional activities;

- knowledge of the regulatory framework in the field of engineering surveys,

principles of design of buildings, structures, engineering systems and equipment, planning and development of settlements;

- knowledge of methods of conducting engineering surveys, technology of designing parts and structures in accordance with the terms of reference using universal and specialized software computing complexes and computer-aided design systems;
- the ability to participate in the design and exploration of objects of professional activity;
- knowledge of the requirements of labor protection, life safety and environmental protection during construction, repair and reconstruction of construction facilities;
- knowledge of the organizational and legal foundations of management and entrepreneurial activities in the field of construction.
- the ability to perform calculations of building structures, their foundations and foundations, engineering systems using modern software products, including BIM technology;
- the ability to develop design solutions that meet the requirements of a promising area of industry development;
- have skills in working with information technologies for searching, collecting, processing, analyzing and storing BIM modeling.

Functions of professional activity

The bachelor in his professional activity performs the following functions:

- carrying out work on the preparation of technical documentation and established reporting on approved forms;
- conducting training and instruction on safety, labor protection and the environment;
- monitoring of compliance with the requirements for the preparation of civil engineering documentation.

5.1 Direction of professional activity

The areas of professional activity according to the level and specialization of skills in accordance with the type of work performed are:

- Head-Manager of a construction company
- Civil engineer, foreman with BIM skills
- Innovative engineer, researcher
- Scientist, teacher
- BIM designer
- BIM Building Maintenance Engineer
- Real Estate Appraisal Engineer.

5.2 Content of professional activity

The professional activity of a bachelor is determined by a set of special theoretical knowledge and practical skills acquired as a result of training and is based on:

- obtaining a full-fledged and high-quality professional education in the field of construction, confirmed by the level of knowledge and skills, skills and competencies, based on criteria established by the State Educational Standard, their assessment, both in content and volume;
- training of professional and competitive specialists in the field of construction;
- ability to apply knowledge of fundamental and applied sciences;
- using methods of analysis and evaluation of experimental results;
- the ability to use methods, skills and modern technical means necessary in engineering practice in the field of construction;
- the ability to find and work with the necessary literature, computer information, databases and other sources of information to solve tasks;
- formation of students' teamwork skills, production and ethical responsibility, the ability to understand the problem and find solutions from working with various specialists, the need to improve their knowledge and skills;
- the ability to work in a team on interdisciplinary topics, while showing individuality, and, if necessary, solve problems independently;
- the readiness of students for professional activity through disciplines that provide fundamental knowledge, skills and work skills in production, government organizations and educational institutions;
- the ability to conduct analysis and monitoring, as well as to make management decisions based on their results;
- possession of erudition, knowledge of modern social and political problems, proficiency in state Russian and foreign languages, tools of the market economy, safety and environmental issues.

5.3 The main national goals of education and the hierarchy of goals (by cycles of disciplines)

Bachelor's degree in OP 6B07311 - "BIM design and construction Management" has the following objectives:

- to implement democratic principles of educational process management in practice, to expand academic freedom and opportunities of higher education institutions;
-to ensure the adaptation of higher education in the specialty and scientific research to the changing needs of society and the achievements of scientific thought;
- to ensure recognition of the level of training of specialists in other countries;
- to ensure higher mobility of graduates in the changing conditions of the labor market.

The purpose of the cycle of general education disciplines (OOD) is to provide

social and humanitarian education based on knowledge of the laws of socio-economic development of society, the history of Kazakhstan, modern information technologies, the state language, foreign and Russian languages as means of interethnic communication.

The purpose of the cycle of basic disciplines (OD) is to provide in-depth knowledge of a natural science, general technical and economic nature as the foundation of professional education.

The purpose of the cycle of core disciplines (PD) is to study the key theoretical aspects of engineering and technology in the field of construction to solve professional problems in the field of research activities; production and technological activities; organizational and managerial activities; design and survey activities.

5.4 Requirements for the level of education of graduates

5.4.1 Requirements for general education

The main requirement for general education is that a graduate receives a full-fledged and high-quality professional education, confirmed by the level of knowledge, skills, skills and competencies, based on the criteria established by the state mandatory standard, their assessment both in content and volume.

5.4.2 Requirements for social and ethical competence

The graduate must possess a humanitarian culture, ethical and legal norms of relations to man, society and the environment, a culture of thinking.

5.4.3 Requirements for economic and organizational management competencies

The graduate must master the basic laws of economic development, factors affecting the technical and economic efficiency of production, knowledge of sociology and psychology in enterprise management, the ability to qualitatively and quantitatively substantiate management decisions.

5.4.4 Requirements for professional competence

The graduate must have professional knowledge in his subject area, know the basics of industrial relations and management principles, taking into account technical, financial and human factors.

The graduate must have a knowledge system for creating and application of modern technologies in his subject area, as well as in related fields; in accordance with his chosen educational trajectory and field of activity, he must have sufficient knowledge, skills, skills and competencies for competent formulation and solution of cartographic and geodetic tasks in his subject area.

5.4.5 Requirements for readiness to change social, economic, professional roles, geographical and social mobility in conditions of increasing dynamism of changes and uncertainties

The professional capabilities of a bachelor specialist in modern conditions must meet the requirements of the global international labor market. A bachelor specialist should be ready to change social, economic, and professional roles, should be geographically and socially mobile in conditions of increasing dynamism of change and uncertainty.

5.4.6 Requirements for education in the main cycles of academic disciplines

The requirements for education in the main cycles of academic disciplines are determined by the specific content of the working curricula of the educational program. In order to acquire a set of professional, intercultural, communicative competencies, a graduate must master the knowledge of a set of general education (OOD), basic (DB) and profile (PD) disciplines as their mandatory component and a component of choice in accordance with the chosen trajectory of education in full (at least 240 credits), established by this state standard.

6Expected results by years of study:

1 year of study

The formation of the personality, ethical and legal foundations of the behavior of the student is carried out. The general provisions of the laws of socio-economic development of society, the history of Kazakhstan are being radically consolidated, knowledge of the state language, foreign and Russian languages is being improved and deepened (to a professional level). Happens further improvement of the apparatus of mathematical analysis and skills in natural science disciplines, the elements of computer graphics and the logical apparatus of descriptive geometry are being mastered for further transition to a deeper study of general scientific and general technical disciplines.

2 year of study

There is a further formation of the fundamental foundations of technical knowledge for this profession on the basis of in-depth study of applied mathematics and a deeper study of general scientific and general technical disciplines. Information competence is being strengthened: computer literacy, mastery of new information and multimedia technologies. Masters the basics of industrial relations and management principles, taking into account technical, financial and human factors, the basics of economic analysis. The skills and abilities acquired in the study of surveying drawing, mining graphics, computer graphics are a necessary basis for studying special disciplines and mastering modern calculation methods. The practice conducted by students in the workplace contributes to their acquisition of the

necessary production skills.

3 year of study

The study of third-year disciplines provides deep theoretical knowledge of basic and specialized disciplines and is one of the stages of preparation for professional activity. Specialized disciplines allow students to master modern methods and techniques of conducting land cadastral works using high technologies and the latest software developments. Practical training in the position of land surveyor, cadastre will allow you to master the main production processes.

4 year of study

This course is the main one in training a specialist who meets the requirements of modern production. As a result of mastering specialized disciplines, the student is prepared both theoretically and practically to perform land cadastral works in all spheres of economic activity. At the pre-graduate practice, the student collects, analyzes and develops the material on the instructions of the supervisor..

Conclusion

Thus, in the competence model of a specialist, the goals of education are associated not only with the performance of specific functions, but also with integrated requirements for the outcome of the educational process. This approach covers, along with specific knowledge and skills, categories such as the ability and willingness to learn, social skills, etc.

Today, making responsible decisions in the field of cadastre and land management takes place in complex dynamic conditions, so the competencies of a modern specialist can be interpreted in the context of modern theory of self-organization, where they act as an important personal resource. Market conditions impose new requirements on graduates, among which the requirements of systemically organized, intellectual, communicative, self-organizing principles receive increasing priority.

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