GRADUATE MODEL (BACHELOR)
Educational programs

6B07310 – Land management and cadastre
(B075 Cadastre and Land Management)

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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 geospatial digital technologies in the direction of cadastre and land management 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 cadastre and land management 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 6B07310 – Land management and cadastrewere formulated.

The content of the training should meet the requirements of the current level of development of the cadastre and land management 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 6B07310 – Land management and cadastre. 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 geospatial digital technologies 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 cadastre and land management 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 6B07310 – Land management and cadastre 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.

Purpose: The purpose of the educational program is to prepare a graduate as a competitive specialist in the field of cadastre and land management, with critical thinking, able to use theoretical and practical information to perform land management and cadastral works in the field of monitoring of land and real estate, cadastral and economic assessment of land and other real estate, regulatory framework in the development of projects.

A graduate in the field of cadastre and land management should be ready for:

- organizational activities that exclude negative phenomena in professional activity, the development of spiritual values, moral and ethical norms of the individual 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 cadastre and land management;
- acquisition of competencies to perform land management and cadastral works in the field of land and real estate monitoring, cadastral and economic assessment of land and other real estate objects, regulatory framework for the development of projects;
- competitiveness in the field of cadastre and land management by increasing competence in the field of advanced technologies of cadastre and land management.

2 List of qualifications and positions

A graduate of the Bachelor's degree in EP 6B07310 – Land management and cadastre is awarded an academic bachelor's degree in geospatial digital technologies.

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:**

- monitor compliance with the land legislation of the Republic of Kazakhstan by state bodies, individuals, legal entities and officials. Interpret the rules for the use of land plots, maintaining the land cadastre and land management, carrying out measures for the rational use and protection of land.
- apply modern geodetic equipment, including UAVs, ground and satellite positioning technologies in solving cadastral and land management tasks;
- apply GIS technologies to solve the problems of land cadastre and land management, including the implementation of cadastral accounting in the GIS environment and spatial fixing of land plots. Use practical work skills and analyze methods for creating and updating digital topographic bases of cadastral plans and maps, as well as automation of cartographic work using software;
- monitor compliance with the land legislation of the Republic of Kazakhstan by state bodies, individuals, legal entities and officials. Interpret the rules for the use of land plots, maintaining the land cadastre and land management, carrying out measures for the rational use and protection of land.
- cartographic support of territorial planning and management of production placement, defense needs of the country, protection and rational use of natural resources in the implementation of environmental programs;
- perform classification and diagnostics of soils, assessment of the main types of soils according to morphological, chemical and physico-mechanical characteristics. Know the factors of soil fertility deterioration and methods of their elimination, land reclamation and soil protection. Possess methods of soil assessment, calculation of the bonus score and preparation of soil maps using GIS technologies;
- compilation, editing and publication of cadastral maps;

organizational and managerial activities:

-organization, planning and management of land management and cadastral works;

-creation of current and forecast cadastral maps;

design and survey activities:

-work on the organization and rationing of labor in the field of cadastre and land management;

-preparation of design and estimate documentation for the production of cadastral and land management works.

Types of professional activity

Bachelors of EP 6B07310 – Land management and cadaster can perform the following types of professional activities:

- Organizational and managerial;
- Design and analytical

3 Descriptors

The sphere of professional activity is all branches of the economy related to the effective management of land resources, including: agricultural lands; lands of settlements (cities, towns and rural settlements); lands of industry, transport, communications, defense and other non-agricultural purposes; lands of specially protected natural territories, lands of recreational, recreational and historical-cultural purposes; forest fund lands; water fund lands; reserve lands.

The objects of professional activity are: land resources of the Republic of all categories; all types of land ownership and land use, including those located within the boundaries of cities, towns and rural settlements, regardless of their distribution by category, intended use and forms of ownership.

The subjects of professional activity are geodetic and topographic surveys of lands; photogrammetric work and mapping of lands, including using geoinformation and digital technologies; conducting and designing land management of all types; land management; organization and conduct of land management and cadastral works.

4 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

Providing in-depth knowledge of natural science, general technical nature as the foundation of professional education.

It is provided by the study of disciplines: higher mathematics (differential and integral calculus, mathematical statistics), physics, chemistry, descriptive geometry and computer graphics. Information competence should also be attributed to general scientific ones:

Possession of modern information and multimedia technologies, the ability to work with a large amount of data with the involvement of BIG DATA technology and tools. The ability to navigate the information flow based on GIS: the ability to find and systematize various sources of information according to a certain criterion and their classification; to use rational methods of obtaining, converting, systematizing and storing information, to update it in the necessary situations of intellectual and cognitive activity using a DBMS. Possession of modern information and multimedia technologies, the ability to work with a large amount of data with the involvement of BIG DATA technology and tools. The ability to navigate the information flow based on GIS: the ability to find and systematize various sources of information according to a certain criterion and their classification; to use rational methods of obtaining, converting, systematizing and storing information, to update it in the necessary situations of intellectual and cognitive activity using a DBMS.

4.4 General technical

The bachelor must be competent in all matters related to the stages of land management and the creation of a land cadastre while ensuring the safety of the technological process and environmental protection.

Competencies are provided by the study of 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. The bachelor should be ready to change social, economic, professional roles, should be geographically and socially mobile in the conditions of increasing dynamism of changes and uncertainties

5. Professional competencies

The purpose of the cycle of profile disciplines (PD) is to possess the key theoretical aspects of methodology, techniques and technologies in the field of cadastre and land management for solving professional tasks in the field of research activities; production and technological activities; organizational and managerial activities; design and survey activities.

5.1 Research activities:

- provision of soil diagnostics, assessment of the main types of soils according to morphological, chemical and physico-mechanical characteristics. To establish factors of soil fertility deterioration. Possess methods of soil assessment, calculation of the bonus score and preparation of soil maps using GIS technologies;

to use the basic laws of the territorial physical and geographical differentiation of the geographical envelope, the properties of the natural landscape and its structures, natural and anthropogenic factors that determine the functioning and development of landscapes. Classify natural and anthropogenic landscapes, design landscape maps and maps of physical and geographical zoning using aerospace survey data.

5.2 Production and technological activities:

use land and real estate management methods. To organize and carry out cadastral and land management works, including the definition of land boundaries with the help of modern geodetic equipment, observing safety regulations;

apply Earth remote sensing data in solving cadastral and land management tasks; perform aerial photography of land plots using unmanned aerial vehicles; perform geospatial data;

apply GIS technologies, system engineering methodology, design automation systems, information and communication technology standards, modern programming languages in professional activities.

5.3 Organizational and managerial activities:

organization and management of land cadastral works based on the current and forecast state of the land fund;

establishment of the boundaries of the land plot and its accessories to provide

title documents in accordance with the legislation of the Republic of Kazakhstan;

control over the rational use of land plots involved in the operation and compliance with environmental safety.

5.4 Design and survey activities:

work on the organization and rationing of labor in the field of cadastre and land management;

preparation of design and estimate documentation for the production of land cadastral works.

5.5 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 land cadastre documentation.

5.6 Typical tasks of professional activity

Professional competencies and skills are aimed at the ability to solve the following typical tasks of professional activity:

- use modern geodetic equipment, including UAVs, ground and satellite positioning technologies in solving cadastral and land management tasks;
- apply GIS technologies to solve the problems of land cadastre and land management, including the implementation of cadastral accounting in the GIS environment and spatial fixing of land plots. Use practical work skills and analyze methods for creating and updating digital topographic foundations of cadastral plans and maps, as well as automating cartographic work using software;
- comply with the regulatory framework of cadastral valuation of land; methods of zoning the territories of cities and rural settlements; perform state cadastral valuation of land. Interpret the cadastral and market value of the land plot and the results of their examination. To determine the economic efficiency in the preparation of estimates;
- monitor compliance with the land legislation of the Republic of Kazakhstan by state bodies, individuals, legal entities and officials. Interpret the rules for the use of land plots, maintaining the land cadastre and land management, carrying out measures for the rational use and protection of land;

to carry out classification and diagnostics of soils, assessment of the main types of soils according to morphological, chemical and physico-mechanical characteristics. Know the factors of soil fertility deterioration and methods of their elimination, land reclamation and soil protection. Possess methods of soil assessment, calculation of the bonus score and preparation of soil maps using GIS technologies;

to use in the work the basic laws of the territorial physical and geographical differentiation of the geographical envelope, the properties of the natural landscape

and its structures, natural and anthropogenic factors that determine the functioning and development of landscapes. Classify natural and anthropogenic landscapes, design landscape maps and maps of physical and geographical zoning using aerospace survey data;

- use modern methods of land and real estate management. Organize and carry out cadastral and land management works, including defining the boundaries of land plots using digital geodetic equipment, observing the rules of safety and vital activity;

- process and use Earth remote sensing data when solving cadastral and land management tasks; perform aerial photography of land plots using unmanned aerial vehicles; perform photo geometric processing of geodetic data, apply GIS technologies to create cadastral and soil maps, digital models of terrain and objects;

- apply GIS technologies, system engineering methodology, design automation systems, information and communication technology standards, modern programming languages in professional activities.

5.7 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 land and cadastral departments; land relations departments, GIS centers, RSE at the State Institute of Agricultural Aerial Geodesic Surveys (GISHAGI) of the Land Management Committee of the Ministry of Agriculture of the Republic of Kazakhstan, the Bureau of Technical Inventory, akimats, PSC, a branch of the NAO "State Corporation "Government for Citizens", etc.

5.8 Content of professional activity

The professional activity of a bachelor is determined by a complex 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 cadastre and land management, confirmed by the level of knowledge and skills, skills and competencies, based on the criteria established by the State Educational Standard, their assessment, both in content and in volume

- training of professional and competitive specialists in the field of cadastre and land management;

- ability to apply knowledge of fundamental and applied sciences;

- using methods of analysis and evaluation of experimental results;

- ability to use methods, skills and modern technical means necessary in engineering practice in the field of cadastre and land management;

- the ability to find and work with the necessary literature, computer information, databases and other sources of information to solve the tasks;

- formation of students' teamwork skills, production and ethical responsibility, the ability to understand the problem and to find solutions from working together with various specialists, the need to improve their knowledge and skills;

- ability to work in a team on interdisciplinary topics, while showing individuality, and, if necessary, solve problems independently;

- 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.

5.9 Requirements for the Bachelor's key competencies in EP 6B07310 – Land management and cadastre

A bachelor **should have an idea** about:

- coordinate systems;
- plans, maps, profiles;
- methods and measurements of topographic surveys;
- taking out the project in kind;
- determining the area;
- the basis of land management;
- distribution of land in the Land Fund of the Republic of Kazakhstan;
- structuring the system of land resources;
- classification of lands by suitability
- based on the land, water, right and multifunctional cadastre;
- the system of accounting, registration and valuation of land;

To know:

- mathematical basis of maps and types of cartographic projections;
- cartographic methods of relief image;
- methods of creating maps in software products;
- land legislation of the Republic of Kazakhstan;
- theoretical foundations of the state land cadastre;
- principles of territorial organization of production and distribution of land by land;
- factors, mechanisms and history of the formation of anthropogenic landscapes, as well as the principles of anthropogenic compatibility;
- factors of soil fertility deterioration and methods of their elimination, land reclamation and soil protection;

- basic knowledge for solving theoretical and practical professional tasks in the field of land reclamation and reclamation;

be able to:

- process results using software products;
- to use knowledge for land resources and real estate management, as well as in the organization and conduct of cadastral and land management works;
- perform analysis of natural and socio-economic systems through computer modeling based on geographic information systems (GIS);
- use the methodology of planning and organization of cadastral works, as well as be able to perform calculations to optimize land management and cadastral works:
- use modern automated GIS systems to solve cadastral problems;
- to control the use of land plots on the basis of monitoring the implementation of measures for the protection and rational use of land;
- perform geodetic measurements using modern geodetic instruments.

have skills in:

- description of the mapped objects and the relationship of the terrain objects in the form of their combinations, intersections and neighborhood;
- using the basics of computer networks and the mechanisms of their operation, and analyze the principles of GIS servers
- using UAVs to efficiently obtain data on the state of the land fund,
- creation of orthophotoplanes, digital models of terrain and terrain;
- processing of UAV data in Agisoft, ArcGIS and QGIS programs.
- performing photogrammetric image processing in the ENVI program;
- in the processing and analysis of satellite survey data for solutions of cadastral and land management tasks;

be competent:

- in the field of cadastre and land management;
- in the field of labor legislation of the Republic of Kazakhstan
- in the field of land legislation of the Republic of Kazakhstan.

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

Bachelor's degree in EP 6B07310 – Land management and cadastre pursues the following goals:

- to implement democratic principles of educational process management in practice, to expand academic freedom and opportunities of higher educational 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 natural science, general technical and economic nature, as the foundation of professional education.

The purpose of the cycle of profile disciplines (PD) is to study the key theoretical aspects of engineering and technology in the field of cadastre and land management for solving professional tasks in the field of research activities; production and technological activities; organizational and managerial activities; design and survey activities.

5.11 Requirements for the level of education of graduates

5.11.1 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.

5.11.2 **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.

5.11.3 **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.

5.11.4 **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.

5.11.5 **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.

5.11.6 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.

6 Expected 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.