



DEVELOPMENT PLAN **EP «7M07329 – Geospatial Digital Engineering»**

1 General information

The EP 7M07329 – Geospatial Digital Engineering" was developed in accordance with the National Qualifications Framework, corresponds to the Dublin Descriptors and the European Qualifications Framework, and is designed based on a modular system for studying disciplines that form general cultural and professional competencies.

The Geospatial Digital Engineering educational program contributes to the achievement of the priority Sustainable Development Goals (SDGs) approved by the United Nations through the training of highly qualified specialists with expertise in geodesy, geoinformatics, digital modeling and spatial analysis. The program focuses on the formation of professional and research skills necessary to solve problems in the field of sustainable spatial planning, environmental safety, digitalization of the urban environment and modernization of infrastructure. Graduates of the program play a key role in the digital transformation of the geodetic industry, the development and application of sustainable technologies, spatial data management and visualization of territories using advanced methods of aerospace surveying, 3D modeling, GNSS and Web-GIS. Their activities are aimed at implementing national and international goals in the field of sustainable development of territories, reducing the risks of natural and man-made disasters, increasing technological efficiency and environmental resilience of infrastructure projects. The EP contributes to the achievement of the following SDGs:

SDG 4. Quality education is the formation of a sustainable system of high-quality, inclusive and affordable education that provides lifelong learning opportunities

SDG 9. Industrialization, innovation and infrastructure – the development of sustainable infrastructure and the introduction of scientific and technological innovations into the economy of the region and the country.

SDG 12. Responsible consumption and production is the development of a system of environmentally responsible consumption and production based on the principles of reduction, reuse and recycling.

SDG 13. Combating climate change – using geospatial technologies to monitor changes in the environment;

SDG 15. Conservation of terrestrial ecosystems is the monitoring and assessment of land use aimed at protecting and restoring natural ecosystems.

The EP "7M07329 – Geospatial Digital Engineering" is intended for the implementation of scientific and pedagogical training of masters in the educational program "Geospatial Digital Engineering" at Satbayev University and was developed within the framework of the direction "Geospatial digital Engineering".

The development plan of the EP "7M07329 – Geospatial Digital Engineering" is consistent with the key indicators of the development program of the S&G Department with the specification of strategic planning indicators, reflecting risk analysis and assessment, the implementation of activities depending on the identified risks, and guarantees for achieving planned results (Appendix).

2 Planning the educational program

Planning and management of the educational program "7M07329 – Geospatial digital Engineering" is carried out on the basis of priority areas and strategic goals of K.I. Satpayev

KazNTU (<https://official.satbayev.university.ru/university/mission-strategy>) and the O.A. Baikonurov Mining and Metallurgical Institute, reflecting the vision, mission, strategic directions and key performance indicators (<https://official.satbayev.university.ru/mining-metallurgy>).

3 The purpose of EP development

The purpose of the educational program is to train highly qualified scientific, technical and engineering personnel in the field of geodesy, geoinformatics, geospatial digital technologies, with the aim of ensuring the openness, security, resilience and environmental sustainability of cities and towns.

4 Objectives of EP development

4.1 Training of specialists for research and design work in the field of geodesy, cartography, geoinformatics, surveying and land management, including in related fields related to the selection of necessary research methods, modification of existing and development of new methods based on the objectives of a specific study;

4.2 Training of specialists for production and technological activities that ensure the introduction of new digital developments at the local level;

4.3 Training specialists to search for and obtain new information necessary to solve professional tasks in the field of knowledge integration in relation to their field of activity, to actively participate in the activities of an enterprise or organization;

4.4 Preparation of specialists for scientific, informational, ideological and problematic communications in a professional environment and in a non-specialist audience with a clear and in-depth justification of their position, engage in organizational, managerial and service activities, and be aware of responsibility for making their professional decisions;

4.5 Preparation of specialists for self-study and continuous professional development during the entire period of scientific or professional activity.

5 Risks of EP implementation (SWOT analysis)

<i>S (strength) – strengths (potentially positive internal factors)</i>	<i>W (weakness) – weaknesses (potentially negative internal factors)</i>
1. High level of brand awareness of the university and trust in the quality of master's degree programs. 2. Positive reputation in the national and international market of educational services in the field of geoinformation and engineering technologies. 3. Experience in implementing innovative educational approaches and interactive forms of learning using modern digital platforms and GIS technologies. 4. The existence of an academic integrity verification system and tools to ensure academic integrity. 5. Active development of international cooperation: existing memoranda and agreements with foreign universities and research centers. 6. Modern material and technical base, including laboratories for 3D modeling, geodesy and digital mapping. 7. High degree of digitalization of the educational process and integration with industry software products (ArcGIS, AutoCAD Civil 3D, QGIS, etc.). 8. Availability of sufficient library stock, including electronic resources and access to international databases (Scopus, ScienceDirect). 9. Provision of master's disciplines with a full range of teaching materials and teaching materials. 10. Stable financial position of the university, ensuring the stable development of the program. 11. Attracting faculty with research and practical	1. Insufficient amount of research and applied work carried out on a grant and contractual basis. 2. The low proportion of scientific publications of undergraduates and teachers in international rating publications. 3. Limited opportunities for the commercialization of scientific developments and the implementation of research results in the production sector. 4. The lack of licenses and certificates for performing a number of specialized geodetic and GIS works, which reduces the university's participation in professional tenders and projects. 5. Limited material and household infrastructure for nonresident undergraduates (lack of places in the dormitory). 6. Insufficient cooperation with regional universities and industry research institutes for joint programs and exchange of experience. 7. The relatively low level of employer involvement in the development and updating of curricula.

experience in geospatial and engineering fields. 12. Conducting educational and research practices on the basis of branches of the department, research and production centers and partner enterprises. 13. The growth of the scientific potential of the department and advanced training of teaching staff through participation in grant projects and international internships.	
<i>O (opportunity) – favorable opportunities (potentially positive external factors)</i>	<i>T (threat) – threats (potentially negative external factors)</i>
1. There is a high need for specialists and scientific and pedagogical staff in the field of geospatial technologies, digital modeling and engineering analysis. 2. The active development of the state policy of digitalization and "smart" territorial systems, which stimulates the demand for graduates of the program. 3. The possibility of integrating new disciplines and modules (3D/4D modeling, digital twins, Smart City, remote sensing) in accordance with the requirements of the labor market and international standards. 4. Expansion of academic mobility and international educational programs (double degrees, Erasmus+, Mevlana, etc.). 5. Conducting PR campaigns, career guidance events and cooperation with employers to increase the influx of motivated bachelor applicants. 6. Almaty has a geographical advantage as a major scientific, educational, innovative and cultural center with a steady demand for highly qualified engineering personnel. 7. The willingness of industrial, mining and infrastructure enterprises in the region to cooperate and provide internship bases, internships and joint research. The demand for graduates of the master's degree in the labor market due to the growing digitalization of the geodetic, cadastral and mining engineering industries.	1. The rising cost of geodetic and computer equipment, software licenses and services in the context of inflation and currency fluctuations. 2. Reducing the financial capacity of partner enterprises to finance joint research and conclude contracts for applied work. 3. Insufficient digital and technical infrastructure in certain regions of Kazakhstan, limiting the development of distance learning and network projects. 4. The risk of an outflow of qualified personnel to foreign universities and research centers. 5. Reducing the level of basic training of incoming applicants (including in foreign languages and ICT competencies). 6. Potential instability of the labor market with changing priorities in the technology sector.

Long-term action plan for the development and improvement of the educational program

№	Event content	Responsible performers	Deadlines for execution
1	Study and analysis of the competitive environment of master's programs of a similar profile in Kazakhstan and the CIS	Head of Department, Teaching staff	2025-2027
2	Development of a strategy for positioning and promoting the educational program among applicants, employers, and partners	Directorate, Head of Department, teaching staff	2025-2027
3	Use of digital and marketing technologies to promote distance learning formats	Head of Department, teaching staff	2025-2027
4	Strengthening career guidance and PR activities; concluding tripartite agreements with enterprises and schools	Head of Department, teaching staff	2025-2027
5	Engaging stakeholders (employers, engineers, GIS specialists) in teaching and assessing competencies	Head of Department, teaching staff	2025-2027
6	Development and implementation of digital interactive learning formats (VR/AR, simulators, 3D modeling)	Head of Department, teaching staff	2025-2027

7	Preparation of the educational program for specialized accreditation (in accordance with IQAA, ASIIN, etc. standards)	Head of Department, Teaching staff	2025-2027
8	Provision of all courses with up-to-date teaching and learning materials, electronic resources, and multimedia content	Head of Department, teaching staff	2025-2027
9	Creation of a database of case studies and training programs in geospatial engineering and GIS	Head of Department, teaching staff	2025-2027
10	Conducting seminars, master classes, and trainings with the participation of IT specialists	Head of Department, teaching staff	2025-2027
11	Organization of scientific seminars and volunteer projects in collaboration with research institutes, public foundations, and universities	Head of Department, teaching staff	2025-2027
12	Participation of faculty staff and master's students in international conferences, competitions, and grant programs	Head of Department, teaching staff	2025-2027
13	Development of the department's scientific schools; integration of faculty research results into the educational process	Head of Department, Teaching staff	2025-2027
14	Engagement of international scholars with high h-index for lectures and joint research	HR, Head of Department, teaching staff	2025-2027
15	Modernization of the material and technical base (equipment, software, laboratories)	Head of Department, teaching staff	2025-2027
16	Development of internal and external academic mobility of faculty and students	Head of Department, teaching staff	2025-2027
17	Expansion of multilingual instruction and development of MOOCs for program courses	Directorate, Head of Department, teaching staff	2025-2027
18	Submission of applications for grant and project funding (MES RK, NCNTI, Horizon Europe, etc.)	Head of Department, teaching staff	2025-2027
19	Professional development and degree advancement of faculty through master's and PhD studies, internships, and	Directorate, Head of Department	2025-2027
20	Publication of teaching and methodological literature prepared by the department's faculty, and provision of TML	Directorate, Head of Department	2025-2027
21	Development of a digital rating system for student knowledge assessment and ensuring public access to grades	AA, DAD, Head of Department, Teaching staff	2025-2027

Reviewed at the meeting of the Department of MSG Protocol №5 dated January 23, 2025y.

Head of MSG Department



Meirambek G.

Development Plan of the Educational Program with Specification of Strategic Planning Indicators, Including Risk Analysis and Assessment,
Activity Implementation Based on Identified Risks, and Guarantees for Achieving Planned Outcomes

№	Target indicators	Unit of measurement	Risks				
			2025-2026	2026-2027	Analysis and evaluation	Strategies	Guarantees
1	Percentage of employed graduates in the first year after graduation	%	-	90	Loss of connection with a graduate	Cooperation with stakeholders and business partners. Feedback from graduates.	Contact information with graduates, business partners, and stakeholders. Employment of graduates. Internal audit
2	Number of joint educational programs	Quantity	-	-	Organization analysis. The educational process in foreign universities and the assessment of the possibility of creating a SOP.	Collaboration with national and international research centers, institutes, and universities. Involvement of highly qualified faculty in departmental activities. Development and implementation of additional assessment methods to evaluate key indicators of learning effectiveness. Development of an action plan for internal and external mobility of students and faculty.	Risk-oriented analysis (SWOT) of the implemented educational programs. Concluding agreements, approval and launch of educational programs, and admission of students to new programs. Internal audit.

3	Number of educational programs in English	Quantity	-	-	Insufficient English proficiency among faculty	Organization and delivery of English language courses for faculty at the university	Availability of international certificates assessing English language proficiency among faculty and students. Internal audit. Semi-annual and annual departmental reports.
4	Increase in student enrollment in distance education programs	Quantity	5	10	Poor awareness of applicants	To activate career guidance work. To intensify work on external and internal academic mobility of teaching staff using modern distance learning technologies	Digital resources of the university. Internal audit.
5	Development and implementation of educational, teaching materials reflecting the results of our own research and the best international	Quantity	4	6	Insufficient implementation of the results of research and development of teaching staff in the development of educational and teaching materials	To consider at the meeting of the department issues related to the development and implementation of teaching staff's own research in the field of teaching methods and to develop methodological guidelines for teaching	Teaching staff with high qualifications and extensive experience in scientific and pedagogical activities. F KazNITU 703-06.

6	The share of updating the scientific equipment fleet from the total number of scientific equipment, %*	Quantity	10	15	Increased cost of equipment due to inflationary costs	Opening and equipping of the scientific and educational laboratory in Geo-Information Engineering (GIE)	Conducting laboratory sessions in accordance with the curriculum of the educational program
7	Increase in protection documents and copyright certificates	Quantity	5	7	Insufficient patenting of faculty research results	Participation of faculty and students in grant competitions organized by the Ministry of Science and Higher Education of the Republic of Kazakhstan (MSHE RK)	Patenting of scientific developments. Patent Department
8	Number of faculty with sufficient English proficiency for conducting research and educational activities	Quantity	4	5	Low English proficiency among senior faculty members	Organization and delivery of English language courses for senior faculty members at the university	Availability of international English language proficiency certificates among faculty and students
9	Share of degree-holding faculty involved in research and experimental design work, %	Quantity	70	75	The percentage of science funding in Kazakhstan is among the lowest in the world (0.13% of GDP).	Increase faculty participation in grant competitions organized by the Ministry of Science and Higher Education of the Republic of Kazakhstan (MSHE RK).	Highly qualified faculty with substantial research experience.

10	Number of publications in scientific journals of the Republic of Kazakhstan recommended by COCSON, Ministry of	Quantity	15	18	Lack of and insufficient funding for scientific research	Increase faculty and student participation in research and student research activities (R&D and SRA).	Faculty with high qualifications and extensive experience in conducting research. Published scientific articles.
11	Number of ongoing research projects	Quantity	6	7	The percentage of science funding in Kazakhstan is among the lowest in the world (0.13% of GDP).	Increase faculty participation in grant competitions organized by the Ministry of Science and Higher Education of the Republic of Kazakhstan (MSHE RK).	Faculty with high qualifications and extensive experience in conducting research.
12	Number of research outcomes implemented in the educational process	Quantity	6	7	Insufficient funding for scientific research	Development and integration of research results into the core disciplines of the curriculum.	Implementation report of research results in the educational process. Open classes.
13	Number of publications in international journals indexed in Scopus / WoS	Quantity	20	23	Insufficient funding for scientific research	Increase faculty participation in grant competitions organized by the Ministry of Science and Higher Education of the Republic of Kazakhstan (MSHE RK).	Faculty with high qualifications and extensive experience in conducting research.

14	Percentage of faculty holding academic degrees (%)	%	75	77	Insufficient number of grants for the training of master's and doctoral students	Recruitment and employment of new staff who have successfully defended their master's and doctoral theses	Awarding of academic and scientific degrees to graduates. Internal audit.
15	Increase in the proportion of faculty and research staff who have undergone professional development domestically and abroad	%	90	95	Insufficient funding	Participation of faculty in the "Bolashak" competition, organization of professional development courses for faculty. Within the framework of the Industrial Advisory Board for the educational program, sign a Memorandum and jointly develop, with various associations, an action plan for the proper preparation of students for professional certification of the program.	Certificate of professional development. Internal audit.

Reviewed at the meeting of the Department of MSG Protocol №5 dated January 23, 2025y.

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