First deputy director for operations of the branch of «NC «Kazakhstan railways» JSC – «Almaty branch of the backbone network»

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CATALOGUE OF UNIVERSITY COMPONENT DISCIPLINES

EDUCATIONAL PROGRAM **6B07336 – Railway construction**

Education level: bachelor's degree **Duration of study: 3 years** **Year of admission: 2025**

Cycle	Component	Discipline name	Total workload		Trimester	Learning outcomes	Brief description of the discipline	Prerequisites	Postrequisites
			in academic hours	in academic credits					
1	2	3	4	5	6	7	8	9	10
BD	VK	Engineering mathematics 1	150	5	1	LO1	The discipline "Engineering mathematics 1" studies the basic concepts of higher mathematics and its applications. The course sections include elements of linear algebra and analytical geometry, an introduction to mathematical analysis, and differential calculus of functions of one and several variables. The purpose of the course is to master the mathematical apparatus for solving theoretical and applied problems of a specific profile, to gain an understanding of mathematical modeling, and to develop analytical and systems thinking, which makes it possible to effectively solve engineering problems. The discipline uses interactive teaching methods and performing computational and graphical work.	Basic school knowledge in mathematics	Engineering mathematics 2, Construction chemicals, Information and communication technologies, Information modeling technology in architecture and construction, Digital inclusion, Basics of Python programming, Resistance of materials, Applied mechanics, Construction mechanics, Mechanics of structural strength, Building materials, Final certification
BD	VK	Engineering mathematics 2	150	5	2	LO1	The formation of students' mathematical knowledge and skills necessary for the study of	Basic school knowledge in mathematics, Engineering	Information and communication technologies, Information

							related natural science disciplines, disciplines of the professional cycle and skills of mathematical modeling and research in professional activities. The course sections include integral calculus of functions of one and several variables, ordinary differential equations, and series theory. Special attention is paid to the application of mathematical methods to solve engineering problems.	mathematics 1, Construction physics, Engineering graphics and computer modeling, Theoretical mechanics, Fundamentals of classical mechanics	modeling technology in architecture and construction, Digital inclusion, Construction mechanics, Mechanics of structural strength, Final certification
BD	VK	Construction physics	150	5	1	LO1	Formation of knowledge, skills and competencies necessary for the development, design and operation of energy-efficient, comfortable and durable buildings and structures. Studies the physical processes and phenomena occurring in building structures and buildings, as well as their interaction with the environment, the basics of building and architectural acoustics, building climatology, lighting engineering, thermal engineering.	Basic school knowledge in physics	Engineering mathematics 2, Construction chemicals, Building materials, Information and communication technologies, Information modeling technology in architecture and construction, Digital inclusion, Resistance of materials, Applied mechanics, Construction mechanics, Mechanics of structural strength, Final certification
BD	VK	Construction chemicals	120	4	2	LO1	The formation of knowledge in the field of building chemistry is associated with the development of science and technology aimed at improving building materials and their application processes. Construction chemistry studies and develops chemical materials, mixtures, and substances that affect the properties of building structures, ensuring their strength, durability, resistance to external influences, and energy efficiency.	Basic school knowledge of chemistry, Engineering mathematics 1, Construction physics	Building constructions, Geology and soil mechanics, Geoinformation systems in geology, Bases and foundations, Geotechnics in foundation engineering, Hydraulics, hydrology, hydrometry, Hydraulic engineering calculations and measurements, Environmentally sustainable technologies, Occupational safety and health, Final certification
BD	VK	Engineering geodesy	180	6	3	LO4,5	Forms professional competencies that determine the readiness and ability of the bachelor to use basic knowledge in the field of geodesy, allows you to make geodetic measurements related to the solution of typical construction tasks, a detailed layout of structures, to control the geometric shapes of the erected structure, perform executive	Engineering graphics and computer modeling, Basics of Python programming	Fundamentals of railway design, Railway surveys and design, Reconstruction of railways, Computer-aided design of railways, Automated railway track design systems, Information modeling technology in architecture and construction,

							surveying results of individual stages of construction and installation work, gives skills for the application of basic geodetic instruments for specific production conditions.		Final certification
BD	VK	Building materials	180	6	2	LO2,3	Apply modern building materials, demonstrate the main indicators of quality, modern methods of production of building materials for the transport industry, the main laws and dependence on the physical and mechanical properties, production technology and conditions of formation, methods of finishing, mastering technological processes of construction production, production of building materials, products and structures on the artificial structures under construction..	Engineering mathematics 1, Construction physics	Building constructions, Resistance of materials, Applied mechanics, Construction mechanics, Mechanics of structural strength, Geology and soil mechanics, Geoinformation systems in geology, Bases and foundations, Geotechnics in foundation engineering, Railway track 1,2,3, Bridges and tunnels on railways, Artificial structures on railways, Final certification
BD	VK	Building constructions	120	4	4	LO2,3	The discipline studies the design, analysis and application of various types of structures such as buildings, bridges and transport structures. It covers materials, mechanical properties and strength calculation methods. Knowledge in this area is necessary to create safe and sustainable facilities that meet modern standards and requirements.	Construction chemicals, Building materials, Theoretical mechanics, Fundamentals of classical mechanics, Resistance of materials, Applied mechanics, Construction mechanics, Mechanics of structural strength	Bases and foundations, Geotechnics in foundation engineering, Railway track 1,,2,3, A seamless path, Bridges and tunnels on railways, Artificial structures on railways, Final certification
BD	VK	Occupational health and safety	150	5	8	LO7,11	Formation of knowledge and skills necessary to ensure safe working and living conditions. The legal and organizational foundations of occupational safety, methods of occupational risk assessment and management, means of individual and collective protection, emergency prevention, as well as measures to prevent injuries and occupational diseases are studied. Special attention is paid to the creation of a safe working environment, compliance with labor protection standards and requirements, as well as the formation of a safety culture in professional activities.	Construction chemicals, Environmentally sustainable technologies, Green economy and sustainable entrepreneurship, Railway construction technology, Technological processes of railway construction, Production practice 1	Maintenance and repair of railway track 2, Railway track diagnostics, Monitoring of the technical condition of the railway track, Production practice 2/ Pre-graduate practice, Final certification

BD	VK	Engineering graphics and computer modeling	120	4	1	LO4	The course covers the principles of technical drawing and engineering graphics, as well as modern 3D modeling methods using specialized software, aimed at developing skills in designing and visualizing technical objects, creating digital models and diagrams, drafting, modeling structures, and analyzing their parameters for solving engineering problems.	Basic school knowledge in mathematics, drawing and computer science	Engineering mathematics 2, Engineering geodesy, Educational practice (geodetic), Information and communication technologies, Digital inclusion, Fundamentals of railway design, Railway surveys and design, Final certification
BD	VK	Basics of Python programming	90	3	2	LO4	The discipline studies the syntax and semantics of the Python language, algorithmization and program design, program structuring and solving problems related to artificial intelligence, learns machine learning, data processing and intelligent system development methods, and analyzes the use of AI in various fields, forming professional competencies in programming and the basics of artificial intelligence.	Engineering mathematics 1	Engineering geodesy, Educational practice (geodetic), Information and communication technologies, Digital inclusion, Computer-aided design of railways, Automated railway track design systems, Information modeling technology in architecture and construction, Final certification
BD	VK	Professionally oriented foreign language	90	3	6	LO9	Formation and development of professional communicative competence in a foreign language necessary for professional activity, proficiency in a professional foreign language for written and oral information exchange, development of skills in reading and understanding professional literature on their specialty in a foreign language, development of the ability to express their thoughts orally and in writing in situations of professional and business communication.	The history of Kazakhstan, Kazakh (russian, foreign) language, Physical culture, Sociology, Cultural studies, Psychology, Basics of law and anti-corruption culture, Environmentally sustainable technologies, Green economy and sustainable entrepreneurship, Fundamentals of financial literacy	Minor program 2, Final certification
BD	VK	Educational practice (geodetic)	60	2	3	LO4,5	Educational practice (geodesy) is a key stage of education for students of architectural, construction and related specialties. It is aimed at consolidating theoretical knowledge in the discipline of Engineering Geodesy and acquiring practical skills in working with geodetic instruments and processing the data obtained.	Engineering graphics and computer modeling, Basics of Python programming	Fundamentals of railway design, Railway surveys and design, Reconstruction of railways, Computer-aided design of railways, Automated railway track design systems, Information modeling technology in architecture and construction, Final certification

PD	VK	Fundamentals of railway design	150	5	4	LO 4,5,10	This discipline covers the basic principles and methods of designing railway lines and junctions, including route determination, the development of plans and profiles, calculations of the earthwork and artificial structures, as well as the fundamentals of construction process organization, ensuring an understanding of the key stages in the creation of railway infrastructure.	Information and communication technologies, Engineering graphics and computer modeling, Engineering geodesy, Educational practice (geodetic)	Railway surveys and design, Reconstruction of railways, Computer-aided design of railways, Automated railway track design systems, Railway track 1,2,3, Bridges and tunnels on railways, Artificial structures on railways, Managerial economics, Time management, Estimated pricing in architecture and construction, Minor program 1,2, Final certification
PD	VK	Railway surveys and design	150	5	5	LO 4,5,10	Studies the discipline as a basis for research and development of road projects in accordance with the SNiP for this category of road, the main operational and energy indicators of the railway route laid on the map in horizontal lines with the placement of artificial structures and the choice of a rational line option using computer technology (Excel, AutoCAD).	Engineering graphics and computer modeling, Engineering geodesy, Educational practice (geodetic), Fundamentals of railway design	Railway track 2,3, Reconstruction of railways, Computer-aided design of railways, Automated railway track design systems, Railway construction technology, Technological processes of railway construction, Managerial economics, Time management, Estimated pricing in architecture and construction, Regulatory and technical documentation in railway construction and track facilities, Minor program 1,2, Production practice 1, Production practice 2/ Pre-graduate practice, Final certification
PD	VK	Reconstruction of railways	150	5	6	LO 4,5,10	Studying the main technical parameters and means of technical equipment, the plan and profile of an existing railway line, their reconstruction to comply with building codes and regulations when increasing train speeds and traffic volume, with the selection of a	Engineering geodesy, Educational practice (geodetic), Fundamentals of railway design, Railway track 1, Railway surveys and design	Railway track 3, Computer-aided design of railways, Automated railway track design systems, Minor program 1,2, Production practice 1, Production practice 2/ Pre-

							phased capacity expansion scheme for the railway based on economic and technical indicators.		graduate practice, Final certification
PD	VK	Railway track 1	150	5	5	LO 2,3,10	The discipline studies the purpose of the railway track and its elements, the requirements for the track depending on the classification of lines, as well as the design and features of rails, sleepers, fasteners and ballast layer. The geometrical parameters of the track, types of materials and elements of the upper structure of the track are considered.	Resistance of materials, Applied mechanics, Construction mechanics, Mechanics of structural strength, Building materials, Building constructions, Fundamentals of railway design	Hydraulics, hydrology, hydrometry, Hydraulic engineering calculations and measurements, Railway track 2,3, A seamless path, Bridges and tunnels on railways, Artificial structures on railways, Reconstruction of railways, Railway construction technology, Technological processes of railway construction, Organization and planning of railway construction, Organization of construction production, Maintenance and repair of railway track 1,2, Minor program 1,2, Production practice 1, Production practice 2/ Pre-graduate practice, Final certification
PD	VK	Railway track 2	150	5	6	LO 2,3,10	The discipline studies the classification of junctions and intersections of rail tracks, the purpose and design of switches, their elements, materials and manufacturing technology. The requirements for the elements, work under load, design principles, standards and tolerances for content, as well as the areas of application of various types of switches are considered.	Resistance of materials, Applied mechanics, Construction mechanics, Mechanics of structural strength, Building materials, Building constructions, Railway track 1, Fundamentals of railway design, Railway surveys and design	Railway track 3, A seamless path, Bridges and tunnels on railways, Artificial structures on railways, Railway construction technology, Technological processes of railway construction, Organization and planning of railway construction, Organization of construction production, Maintenance and repair of railway track 1,2, Minor program 1,2, Production

									practice 1, Production practice 2/ Pre-graduate practice, Final certification
PD	VK	Railway track 3	150	5	7	LO 2,3,10	Studying the main technical parameters and means of technical equipment, the plan and profile of an existing railway line, their reconstruction to comply with building codes and regulations when increasing train speeds and traffic volume, with the selection of a phased capacity expansion scheme for the railway based on economic and technical indicators.	Resistance of materials, Applied mechanics, Construction mechanics, Mechanics of structural strength, Building materials, Building constructions, Geology and soil mechanics, Geoinformation systems in geology, Bases and foundations, Geotechnics in foundation engineering, Fundamentals of railway design, Railway track 1,2, Railway surveys and design, Reconstruction of railways, Production practice 1	Organization and planning of railway construction, Organization of construction production, Maintenance and repair of railway track 1,2, Minor program 2, Production practice 2/ Pre-graduate practice, Final certification
PD	VK	A seamless path	150	5	7	LO 2,3,10	This discipline studies the design and operational features of seamless railway tracks, examining their advantages and disadvantages, laying and repair technologies, as well as issues of ensuring track stability and interaction with rolling stock.	Resistance of materials, Applied mechanics, Construction mechanics, Mechanics of structural strength, Building materials, Building constructions, Railway track 1,2, Production practice 1	Maintenance and repair of railway track 1,2, Minor program 2, Production practice 2/ Pre-graduate practice, Final certification
PD	VK	Maintenance and repair of railway track 1	180	6	8	LO 8,10,11	The discipline is designed to study the main components of the track management system, the classification of tracks depending on operational parameters, operating conditions of the railway track, the nature of deformations occurring in it, a systematic approach to analyzing the actual condition of the railway track and its additional facilities, taking into account the operational	Hydraulics, hydrology, hydrometry, Hydraulic engineering calculations and measurements, Railway track 1,2,3, A seamless path, Bridges and tunnels on railways, Artificial structures on railways, Railway construction technology, Technological	Railway track diagnostics, Monitoring of the technical condition of the railway track, Minor program 3, Production practice 2/ Pre-graduate practice, Final certification

							parameters of the railway line section.	processes of railway construction, Production practice 1	
PD	VK	Maintenance and repair of railway track 2	150	5	9	LO 8,10,11	The discipline is designed to study the theoretical foundations and modern progressive technologies of track repair, types of railway track repairs, methods of designing technological processes for certain types of track repair and complex complexes of railway track repairs, methods of calculating the needs for material, technical and labor resources for railway track maintenance and repair.	Hydraulics, hydrology, hydrometry, Hydraulic engineering calculations and measurements, Railway track 1,2,3, A seamless path, Bridges and tunnels on railways, Artificial structures on railways, Railway construction technology, Technological processes of railway construction, Track, construction machinery and equipment, Machines and mechanisms in the travel industry, Occupational safety and health, Regulatory and technical documentation in railway construction and track facilities, Minor program 2, Production practice 1	Final certification, Basic and profile disciplines of the master’s degree
PD	VK	Production practice 1	150	5	6	LO 5,7,8,10	The main objectives of industrial practice 1 are: consolidation of theoretical knowledge and practical skills in the chosen educational program in an industrial environment, acquisition of organizational work experience, obtaining a working specialty, formation of practical skills and competencies in the process of mastering the bachelor's program. It is conducted in the practice bases at enterprises according to this educational program.	Railway track 1,2, Railway surveys and design, Reconstruction of railways	Maintenance and repair of railway track 1,2, Occupational safety and health, Regulatory and technical documentation in railway construction and track facilities, Production practice 2 / Pre-graduate practice, Final certification
PD	VK	Production practice 2 / Pre-graduate practice	150	5	9	LO 5,7,8,10	The purpose of the 2 / Pre-graduate internship for bachelors is to ensure the	Railway track 1,2,3, A seamless path, Railway surveys and	Maintenance and repair of railway track 1, Final

							relationship between the theoretical knowledge gained during the assimilation of the chosen educational program and practical activities. The objectives of this practice are to consolidate and deepen the theoretical knowledge acquired by students in during the learning process, collecting information for writing a final qualifying thesis, studying best practices at the enterprise, as well as gaining experience in independent research, mastering various methods of scientific work. It is conducted in the practice bases at enterprises according to this educational program.	design, Reconstruction of railways, Occupational safety and health, Regulatory and technical documentation in railway construction and track facilities, Production practice 1	certification
PD	VK	FINAL CERTIFICATION	240	8	9	LO1-LO11	The objectives of the thesis are to identify the degree of assimilation by the bachelor of the content of the educational program, to check his readiness for independent activity in the direction of the educational program, to consolidate and deepen practical work skills. A comprehensive exam is also provided.		
		Total:	**3480**	**116**					

Head of the department of «Transport construction» **G.B. Karibaeva**