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«_19_» __03__ 2025 y.

CATALOG OF UNIVERSITY COMPONENT DISCIPLINES

EDUCATIONAL PROGRAMS 6B07183 - SMART ROADS: DIGITAL TECHNOLOGIES IN TRANSPORT FACILITIES

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

Cycle	Component	Name of the discipline	Total labor intensity		Term	Learning outcomes	Brief description of the discipline	Prerequisites	Post-requirements
			in academic hours	in academic loans					
2	3	4	5	6	7	8	9	10	11
BD	UC	Engineering Mathematics 1	150	5	1	LO2	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	Construction Physics
BD	UC	Engineering Mathematics 2	150	5	2	LO2	The formation of students' mathematical knowledge and skills necessary for the study of 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.	Basic school knowledge in mathematics	Construction Physics

BD	UC	Building Physics	150	5	1	LO2	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	Construction chemicals
BD	UC	Construction chemicals	120	4	2	LO2	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, additives and substances that affect the properties of building structures, ensuring their strength, durability, resistance to external influences and energy efficiency. An important part of the course is studying the environmental impact of building chemicals.	Basic school knowledge of chemistry	Construction materials and technologies Occupational health and safety
BD	UC	Engineering geodesy	180	6	3	LO7	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 surveying results of individual stages of construction and installation work, gives skills for the application of basic geodetic instruments for specific production conditions.	Engineering Mathematics 1,2	Building structures Engineering graphics and computer modeling
BD	UC	Building materials and technologies	180	6	2	LO9	The discipline studies the properties, classification and application of various building materials, such as concrete, asphalt concrete, bitumen, brick, metal and wood. It covers modern technologies for their production and processing, as well as methods for assessing quality. Knowledge in this area is necessary for the effective design and construction of facilities.	Construction chemicals	Building structures Occupational safety and health Innovative technologies for reconstruction and repair of urban highways
BD	UC	Building structures	120	4	4	LO4 LO9	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 and technologies	Occupational safety and health Innovative technologies for reconstruction and repair of urban highways
BD	UC	Occupational safety and health	150	5	8	LO9	The discipline studies the direction of students' 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 Engineering geodesy Building materials and technologies	Innovative technologies for reconstruction and repair of urban highways Engineering networks and communications in cities Urban roads: elements and their impact on safety

BD	UC	Engineering graphics and computer modeling	120	4	1	LO3 LO9	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.	Engineering geodesy Building structures	Fundamentals of urban road design and planning Innovative technologies for reconstruction and repair of urban highways Engineering networks and communications in cities Digital technologies in the traffic monitoring and management system
BD	UC	Python pogramming basics	90	3	2	LO3 LO9	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 geodesy Building structures	Fundamentals of urban road design and planning Innovative technologies for reconstruction and repair of urban highways Engineering networks and communications in cities Digital technologies in the traffic monitoring and management system
BD	UC	Professionally oriented foreign language	90	3	6	LO8	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.	Engineering geodesy Building structures	Operation and maintenance of urban roads Engineering equipment of urban roads and streets
PD	UC	Fundamentals of urban road design and planning	180	6	4	LO11	The discipline studies the principles of creating safe, efficient and convenient streets. It covers geometry, traffic management, infrastructure, landscaping and landscaping, taking into account digital inclusion, as well as regulatory requirements and modern approaches to designing a sustainable urban environment.	Engineering geodesy Engineering graphics and computer modeling	Innovative technologies for reconstruction and repair of urban highways Engineering networks and communications in cities Digital technologies in the traffic monitoring and management

									system
PD	UC	Innovative technologies for reconstruction and repair of urban highways	150	5	6	LO10	The discipline studies modern methods and technologies for reconstruction and repair of city streets, including innovative materials, equipment and approaches. The issues of sustainable development, increasing the efficiency of work, reducing costs and environmental impact, as well as digitalization of processes and management of urban infrastructure are considered. .	Building materials and technologies Building structures Occupational safety and health	Innovative technologies in road construction Engineering networks and communications in cities Drainage in the urban road network
PD	UC	Engineering networks and communications in cities	150	5	5	LO9	The discipline is aimed at developing in students a comprehensive understanding of engineering systems, their interrelations and impact on urban infrastructure, as well as developing skills in the design and analysis of engineering solutions for sustainable urban development, such as water supply, sanitation, electricity supply, gas supply and centralized and decentralized heat supply systems, including boiler houses and heating networks.	Engineering graphics and computer modeling Basics of Python programming Fundamentals of urban road design and layout	Operation and maintenance of urban roads Engineering equipment of urban roads and streets Sanitary conditions on the urban road network
PD	UC	Innovative technologies in road construction	150	5	5	LO10	The course is aimed at studying modern methods and technologies used in the design, construction and operation of road infrastructure, automation of processes using information technologies to optimize design and construction management using BIM technologies, sustainable development, drones and other digital tools for monitoring and managing construction projects, modeling and simulation to optimize design solutions, taking into account people with disabilities.	Fundamentals of urban road design and layout Innovative technologies for reconstruction and repair of urban highways	Sanitation in the urban road network Digital technologies in the traffic monitoring and management system Urban roads: elements and their impact on safety
PD	UC	Sanitation in the urban road network	150	5	6	LO9	The discipline studies methods and technologies for managing rainwater and wastewater in urban environments. It covers the design of wastewater systems, assessment of their efficiency and impact on the environment, as well as issues of sustainable development and minimization of flooding in urban infrastructure.	Engineering graphics and computer modeling. Basics of Python Programming Fundamentals of urban road design and planning	Operation and maintenance of urban roads Engineering equipment of urban roads and streets Urban roads: elements and their impact on safety
PD	UC	Operation and maintenance of urban roads	150	5	7	LO10	The discipline covers methods and technologies for maintaining road infrastructure, taking into account digital inclusion and sustainable development. It includes planning, condition monitoring, repairs and prevention, as well as traffic management. The main focus is on ensuring the safety, comfort and durability of roads, which contributes to improving transport accessibility and reducing the negative impact on the environment.	Fundamentals of urban road design and planning Innovative technologies for reconstruction and repair of urban highways	Engineering equipment of urban roads and streets Urban roads: elements and their impact on safety

PD	UC	Engineering equipment of urban roads and streets	150	5	7	LO11	The discipline covers the design, installation, and maintenance of engineering systems such as lighting, sanitation, road markings, and signs. It ensures safety, sustainable development and digital inclusion, comfort and functionality of the transport infrastructure, facilitating efficient movement and improving the quality of the urban environment for residents and visitors.	Engineering graphics and computer modeling Basics of Python Programming Innovative technologies for reconstruction and repair of urban highways	Digital technologies in the Urban Roads traffic monitoring and management system: elements and their impact on safety
PD	UC	Digital technologies in the traffic monitoring and management system	150	5	8	LO11	The discipline covers modern methods and tools for optimizing traffic flows. She studies the use of sensors, data analytics and software to improve traffic efficiency, reduce congestion and improve road safety, as well as the implementation of innovative solutions in transport infrastructure.	Engineering graphics and computer modeling Basics of Python Programming Fundamentals of urban road design and planning	Urban roads: elements and their impact on safety
PD	UC	Urban roads: elements and their impact on safety	150	5	9	LO11	The discipline studies the structural elements of road infrastructure and their impact on traffic safety. Factors such as road geometry, signage, lighting and medians are considered. The goal is to develop recommendations to improve safety and reduce accidents on city roads.	Basics of Python Programming Fundamentals of urban road design and planning Digital technologies in the traffic monitoring and management system	Final certification
Total			**5280**	**176**					

Head of the Department Construction Engineering Kulmanov K.S.