AGREED
Chief Project Engineer,
«Aynur Build Project LLP»
Kurmanbekov Zh.K.
2025 y.

APPROVED
Director of the Institute
"Transport Engineering"
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«19» 03 2025 y.

CATALOG OF DISCIPLINES OF THE COMPONENT BY CHOICE

EDUCATIONAL PROGRAM
Educationlevel:2025

6B07348- Construction of highways and airfields
bachelor courseDuration of study: 3 years

Cycle	Component	Name of the discipline	Totallaborintensity		Term	Resultsofthestudy	Brief description of the discipline	Prerequisites	Post-requirements
			inacademichours	inacademiccredits					
1	2	3	4	5	6	7	8	9	10
OD D	SQ	Environmentally sustainable technologies				RO8	The discipline "Environmentally sustainable technologies" studies modern methods and innovative solutions aimed at minimizing the negative impact of human activities on the environment. The course examines the principles of sustainable development, energy-saving technologies, renewable energy sources, waste management strategies, and environmentally sound production processes.	Construction Materials, Geology and Soil Mechanics, Geographic Information Systems in Geology	Occupational Health and Safety, Highway Construction Technology 1, 2, Highways and Airfields
OD D	SQ	Green economy and sustainable entrepreneurship	150	5	5	RO10	The discipline "Green Economy and Sustainable Entrepreneurship" is devoted to the study of environmentally oriented economic models and business strategies aimed at sustainable development. The course examines the concepts of the green economy, ESG (Environmental, Social, Governance) approaches, circular economy,	Construction Materials, Geology and Soil Mechanics, Geographic Information Systems in Geology	Occupational Health and Safety, Highway Construction Technology 1, 2, Highways and Airfields

							sustainable business models and their impact on global markets.		
OD D	SQ	Fundamentals of financial literacy				RO 11	The discipline is aimed at developing the ability to make informed financial decisions, plan income and expenditures, assess risks and effectively manage their resources in a market economy. It studies the basic knowledge in the sphere of finance and rational management of monetary resources, the concepts of financial system, budget, banking products, crediting, savings, investments, insurance, taxation and protection against financial fraud are considered.	Engineering Mathematics 1.2, Construction Materials, Construction Structures	Finalcertification
OD D	SQ	Digital inclusion				RO11	The discipline "Digital Inclusion" is devoted to the study of the principles of ensuring equal access to digital technologies and information for all social groups, including people with disabilities. The course examines barriers to digital inequality, strategies for overcoming them, technologies for adapting the digital environment, and government initiatives to develop an inclusive digital society.	Building materials, Building structures, Geographic information systems in geology, Geology and soil mechanics, Information and communication technologies	Road reconstruction, Road construction technology, Road bridges and tunnels, Road structures, Automated road design
OD D	SQ	Basics of law and anti-corruption culture				RO11	The discipline outlines the fundamental concepts of law, the constitutional structure of the state power of the Republic of Kazakhstan, the rights and freedoms of citizens enshrined in the Constitution, the mechanism and protection of legitimate human interests in case of	History of Kazakhstan, Foreign language, Kazakh (Russian) language, Sociology, Culturology	Finalcertification

							their violation. The discipline forms students' improvement of public and individual legal awareness and legal culture, as well as a system of knowledge and citizenship on combating corruption as an antisocial phenomenon.		
BD	EC	Theoretical mechanics	120	4	1	RO1, RO2	Formation of scientific engineering thinking. To familiarize with the basic concepts, laws and theorems that make it possible to compose equations describing the behavior of mechanical systems, the ability to record a specific phenomenon in mathematical form, the use of basic methods of mechanics in the study of motion and equilibrium of mechanical systems in the study of disciplines of the professional cycle.	Engineering Mathematics 1.2, Construction Physics	Geology and soil mechanics, foundations and foundations, bridges and tunnels on highways
BD	EC	Fundamentals of classical mechanics				RO1, RO2	The discipline aims to develop skills in solving problems and the ability to analyze and solve tasks in the field of statics and dynamics of rigid bodies and oscillatory motion, studying the main mathematical models used in theoretical mechanics, kinematic characteristics of the motion of material points and systems, solving statics problems using equilibrium conditions of force systems, and dynamics based on Newton's second law with the application of fundamental theorems of dynamics.	Engineering Mathematics 1.2, Construction Physics	Strength of materials, Applied mechanics, Structural mechanics, Strength mechanics of structures
BD	EC	Resistance of materials	150	5	2	RO1, RO2	Formation of fundamental knowledge in the field of calculations of structural elements for strength, stiffness and stability, mastering the calculation and experimental foundations and practical methods of calculation of structures under the condition of reliability, durability, efficiency, considering the mechanical properties of structural materials and the ability to design by strength criteria correctly evaluating the limiting state,	Fundamentals of classical mechanics, Theoretical mechanics	Structural mechanics, Mechanics of structural strength, Geology and soil mechanics, foundations and foundations, Geographic

							conducting verification and design calculations, using modern educational and information technology.		information systems in geology, Bridges and tunnels on highways
BD	EC	Applied mechanics				RO1, RO2	This discipline develops practical skills in applying the laws of theoretical mechanics and strength of materials to calculate the strength, stiffness, and stability of machine elements and engineering structures, as well as to analyze their motion and interaction under various types of loads, with the aim of further designing reliable and efficient technical systems.	Fundamentals of classical mechanics, Theoretical mechanics	Structural Mechanics, Strength Mechanics of Structures, Geology and Soil Mechanics, Foundations and Foundations
BD	EC	Construction mechanics	150	5	3	RO1, RO2	Formation of skills in designing standard structures related to the choice of a design scheme, determining the most loaded structural elements and calculating internal forces and stresses. Studies methods for calculating forces in statically definable and indeterminate rod systems under the action of constant and temporary loads, determining displacement in rod systems to ensure the strength and reliability of structures in combination with high efficiency.	Fundamentals of Classical Mechanics, Theoretical Mechanics, Strength of Materials, Applied Mechanics,	Geology and soil mechanics, foundations and foundations, geoinformation systems in geology, bridges and tunnels on highways
BD	EC	Mechanics of structural strength				RO1, RO2	Formation of skills in the field of work analysis and calculation of structures made of various materials under various influences using modern computing equipment. Studies the features of the laws of stress and strain distribution in structural elements under various conditions of external load, principles and methods of static and dynamic calculation of	Engineering graphics in computer modeling, basics of Pylton programming. Engineering surveying, Theoretical mechanics, Strength of materials,	Soil Geology and Mechanics, Foundations and Foundations, Road Reconstruction, Road Construction

							engineering structures for strength, rigidity, stability.	Structural mechanics, Structural strength mechanics	Technology, Highways and Airfields, Road Bridges and Tunnels, Artificial Structures on Roads
BD	EC	Geology and Soil Mechanics	15	5	4	RO3, RO7	The discipline is aimed at developing professional competencies in the field of engineering geology and soil mechanics to solve practical problems in assessing and analyzing the engineering and geological conditions of the construction of city streets and road infrastructure.	Information and Communication Technologies, Engineering Mathematics 1 and 2, Construction Physics, Construction Chemistry, Engineering Geodesy, Theoretical Mechanics, Strength of Materials, Structural Mechanics, Structural Strength Mechanics	Road reconstruction, Road construction technology, Highways and airfields, Road operation, Bridges and tunnels on roads, Artificial structures on roads
BD	EC	Geoinformation systems in geology				RO3	The discipline teaches the skills of engineering and geodetic calculations and methods of working with modern geodetic instruments to carry out marking work on the ground, control the production and quality of work performed at each stage of the construction process, and monitor geological and hydrogeological processes.	Information and Communication Technologies, Engineering Mathematics 1 and 2, Construction Physics, Engineering Geodesy, Construction Materials, Construction Structures, Theoretical Mechanics, Strength of Materials, Structural Mechanics	Road reconstruction, Road construction technology, Highways and airfields, Road operation, Bridges and tunnels on roads, Artificial structures on roads

BD	EC	Foundations and bases	150	5	5	RO3, RO7	Formation of knowledge about the basic laws of soil behavior under load, the theory of stress-strain state and their interaction with structures. Studies the main methods for determining the sediment of foundations, the stability of slopes and slopes, as well as the morphology, dynamics and regional features of the upper horizons of the Earth's crust (lithosphere) and their relationship with engineering structures	Engineering Graphics in Computer Modeling, Pylton Programming Basics, Engineering Surveying, Building Materials, Building Structures, Theoretical Mechanics, Strength of Materials, Structural Mechanics	Road reconstruction, Road construction technology, Highways and airfields, Road operation, Bridges and tunnels on roads, Artificial structures on roads
BD	EC	Geotechnics in foundation engineering				RO3, RO7	The discipline considers the formation and development of areas of plastic deformation in a homogeneous base of a buried flexible strip foundation when it is loaded within the framework of a model of a mixed problem of the theory of elasticity and the theory of soil plasticity.	Engineering Graphics in Computer Modeling, Pylton Programming Basics, Engineering Surveying, Building Materials, Building Structures, Theoretical Mechanics, Strength of Materials, Structural Mechanics	Road reconstruction, Road construction technology, Highways and airfields, Road operation, Bridges and tunnels on roads, Artificial structures on roads
BD	EC	Hydraulics, hydrology, hydrometry	120	4	7	RO3, RO7	The course of the discipline "Hydraulics, hydrology, hydrometry" includes the study of the movement and equilibrium of liquids, the laws and characteristics of their manifestation, water processes and modes of water flows, methods for determining water parameters. The theoretical set of knowledge is applicable in the design of transport structures, as well as in hydraulic engineering construction.	Foundations and foundations, Geotechnical engineering in foundation construction, Engineering surveying, Construction materials, Building structures	Road reconstruction, Road construction technology, Highways and airfields, Road operation, Bridges and tunnels on roads, Artificial

									structures on roads
BD	EC	Hydrotechnical calculations and measurements				RO1, RO3	The discipline "Hydraulic calculations and measurements" studies methods for calculating water flow rates, head, filtration and stability of culverts in the design of transport structures. The course covers methods for measuring hydrological characteristics, analysis of field studies, modeling of processes in river beds, calculation of culverts and protective structures.	Foundations and foundations, Geotechnical engineering in foundation construction, Engineering surveying, Construction materials, Building structures	Fundamentals of Highway Design, Surveying and Designing Highways, Reconstruction of Highways, Highway Construction Technology 1, 2, Bridges and Tunnels on Highways, Artificial Structures on Highways
BD	EC	Managerial Economics	90	3	6	RO4, RO11	Formation of the conceptual apparatus and development of skills of economic analysis using modern models and patterns of economic science, consideration of economic problems and challenges facing the head of the firm. The study of this discipline will allow students to obtain and develop knowledge in the field of analytical research of economic, technological and technical parameters of the enterprise, as well as allow you to master the skills of using special methods of economic justification of management decisions and assessment of their consequences.	Fundamentals of financial literacy, Fundamentals of law and anti-corruption culture	Final certification
BD	EC	Time - management				RO10, RO11	The discipline studies a system of methods, tools and approaches that are aimed at effective time management in order to achieve set goals. The	Fundamentals of financial literacy, Fundamentals of law	Final certification

							course is designed to improve skills in organizing and optimizing the use of working time, increasing productivity, reducing stress, planning, delegation, using tools and technologies, as well as knowing your time and energy rhythms in order to use your time effectively.	and anti-corruption culture	
BD	EC	Computer-aided design of highways	120	4	7	RO4, RO5	The program of the course "Automated Road Design" considers the principles and methods of designing roads using specialized software products. Digital technologies of routing, terrain modeling, calculation of geometric and technical parameters of the road and design documentation are studied. The discipline includes the study of all stages of automation, work in CAD, the basics of 3D modeling and the integration of geodetic survey data.	Fundamentals of road design, Surveying and design of roads, Reconstruction of roads	Bridges and tunnels on highways, Artificial structures on highways
BD	EC	Automated highway design systems				RO4, RO10	The program of the discipline "Automated Road Design Systems" studies modern information technologies and software and their use for design of road elements and roadside infrastructure from the standpoint of road safety. The training material of the course includes a review of methods and tools for implementing design solutions, as well as optimizing design processes using CAD systems.	Fundamentals of road design, Surveying and design of roads, Reconstruction of roads	Bridges and tunnels on highways, Artificial structures on highways
BD	EC	Bridges and tunnels on highways	120	4	8	RO4, RO7	Formation of skills in the calculation, design and operation of road bridges and tunnels. Studies the issues of designing objects of surface and underground infrastructure of the road industry in difficult hydrological and engineering-geological conditions, under seismic and man-made impacts on bridge crossings, tunnel crossings, the implementation of the most rational and effective design solutions	Geology and Soil Mechanics, Foundations and Foundations, Road Reconstruction, Road Construction Technology, Highways and Airfields	Road conditions and traffic safety, Quality control of road construction works

							for artificial structures on highways and internal arrangements of tunnel complexes.		
BD	EC	Artificial structures on highways				RO3, RO7	The formation of artificial structures on highways, including the design, construction, and operation of bridges, tunnels, viaducts, and other elements that ensure the safety and efficiency of transportation, as well as enhance the durability of infrastructure.	Geology and Soil Mechanics, Foundations and Foundations, Road Reconstruction, Road Construction Technology, Highways and Airfields	Road conditions and traffic safety, Quality control of road construction works
BD	EC	Road construction machinery and equipment	120	4	3	RO3, RO8	To familiarize students with the nomenclature of modern road construction machines and mechanisms, equipment, traction means, a modern fleet of transport and construction machines, their purpose and principles of operation, optimization of operating modes under specified operating conditions to achieve maximum efficiency, to teach them to choose types of machines for the production of various types of work using interactive teaching methods.	Occupational Health and Safety, Engineering Geodesy, Construction Materials	Quality control of road construction materials, Quality control of road assets
BD	EC	Machines and mechanisms in the automotive and road industry				RO3, RO8	Formation of knowledge in the field of mechanization and automation of works on repair, construction and current maintenance of highways using road machines and mechanisms. The discipline studies machines and equipment for the extraction and processing of stone materials, for the preparation and transportation of asphalt concrete mixtures and work with bitumen, for the construction of road surfaces and airfields, complexes for the maintenance and repair of highways and airfields.	Occupational Health and Safety, Engineering Geodesy, Construction Materials	Quality control of road construction materials, Quality control of road assets
BD	EC	Organization and planning of construction of	150	5	7	RO10, RO8	Formation of students' knowledge and	Reconstruction of highways, Technology of	Road conditions and traffic

		highways and airfields					skills necessary for drawing up plans and schedules for construction work, effective management and coordination of construction projects in the field of transport infrastructure. Studies a wide range of aspects related to the effective management, planning and coordination of the construction of transport infrastructure, systems and methods of quality control of construction work.	construction of highways 1,2,	safety, Quality control of road construction works, Quality control of road assets
BD	EC	Organization of construction production				RO10, RO8	The formation of students' professional skills on the basic principles and methods of organizing road works, organizational and technical training and calendar planning of road works, as well as gaining knowledge in the field of production and economic activities of enterprises when choosing rational options for organizational and planning solutions that ensure increased economic efficiency of production. Studies the principles and methods of project management, time control and planning, and resource allocation.	Reconstruction of highways, Technology of construction of highways 1,2,	Road conditions and traffic safety, Quality control of road construction works, Quality control of road assets
BD	EC	Diagnostics of highways	150	5	8	RO8, RO9	The course covers methods for diagnostics and quality control of road construction, including road condition analysis, damage diagnostics, the use of modern materials and technologies, and ensuring compliance with construction standards to guarantee reliability and durability.	Technology of construction of highways and airfields 1.2, Operation of highways	Road conditions and traffic safety, Quality control of road construction works, Quality control of road assets
BD	EC	Ensuring the life cycle of the road				RO5, RO9	The purpose of the discipline is to form knowledge about the comprehensive provision of the life cycle of a highway, taking into account the diagnosis of geometric	Technology of construction of highways and airfields 1.2,	Road conditions and traffic safety, Quality

							and transport-operational qualities of a highway. The stages of design, construction, operation, repair and disposal of destroyed structures that cannot be repaired, methods for assessing the technical condition of road elements, the use of diagnostic equipment and engineering decisions based on the data obtained are studied.	Operation of highways	control of road construction works, Quality control of road assets
BD	EC	Quality control of road construction works	180	6	9	RO8, RO9	The purpose of the discipline is to study quality control methods at various stages of road construction work. The course examines the principles of monitoring the compliance of construction processes and materials with regulatory requirements and standards, as well as methods for diagnosing and monitoring the condition of road construction facilities.	Road Diagnostics, Road Lifecycle Management, Bridges and Tunnels on Roads, Artificial Structures on Roads	Final certification
BD	EC	Quality control of road assets				RO8, RO9	The purpose of the discipline is to develop students' knowledge and skills in the field of assessment, monitoring and quality assurance of road assets, including methods of monitoring, diagnosing and managing their condition to improve safety, operational efficiency and prolong the service life of road infrastructure.	Road Diagnostics, Road Lifecycle Management, Bridges and Tunnels on Roads, Artificial Structures on Roads	Final certification
BD	EC	Information Modeling technology in the field of architecture and construction	90	3	7	RO4, RO5	The purpose of the course "Information Modeling Technology in Architecture and Construction" is to provide students with the basics of theoretical and practical knowledge and skills in the use of information modeling technologies (BIM) used in the design, construction and operation of buildings and transport facilities, as well as to improve the effectiveness of interaction between participants in the construction process.	Road Diagnostics, Road Lifecycle Management, Bridges and Tunnels on Roads, Artificial Structures on Roads	Final certification
BD	EC	Minor program 1				RO3, RO6	The first of the three disciplines, which allows you to form additional	Road Diagnostics, Road Lifecycle Management, Bridges	Final certification

							professional competencies in various subject areas.	and Tunnels on Roads, Artificial Structures on Roads	
BD	EC	Regulatory and technical documentation in automobile and road construction and road management	90	3	8	RO5, RO9	The purpose of the discipline "Regulatory and technical documentation in road construction and road facilities" is to form knowledge among students in the process of teaching about a set of regulatory and technical documents that determine the requirements for the design, construction, reconstruction and operation of roads. The discipline course covers the structure and content of regulatory documents. The program forms skills of competent application of regulatory and technical documentation in professional activities.	Fundamentals of Highway Design, Road Surveying and Design. Road Reconstruction	Final certification
BD	EC	Minor program 2				RO5, RO7	The second of the three disciplines, which allows you to form additional professional competencies in various subject areas.	Fundamentals of Highway Design, Road Surveying and Design. Road Reconstruction	Final certification
BD	EC	Estimated pricing in architecture and construction	90	3	9	RO5, RO6	The purpose of the course is to determine the volume, cost, and complexity of the upcoming work, as well as to monitor the completion of work and the consumption of materials. The means of cost estimation are the current estimated regulatory documents of the Republic of Kazakhstan, which contain information on labor costs, the time of use of machines, mechanisms, necessary materials, products and	Organization and planning of construction of highways and airfields	Final certification

							structures, both in quantitative and monetary measures, distributed by type of work		
BD	EC	Minor program 3				RO6. RO11	The third of the three disciplines, which allows you to form additional professional competencies in various subject areas.	Organization and planning of construction of highways and airfields	Final certification
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Head of the Department Construction Engineering

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