

AGREED

Deputy Head of production of the Almaty operational locomotive depot of the branch of LLP "KTZ-Freight transportation" - "Almaty branch of FT"

Iskakov M.S.

**APPROVED**

Director of the Institute

"Transport and construction"

Abdreshov Sh.A.

«18» 03 2025 y.

CATALOG OF DISCIPLINES OF THE COMPONENT BY CHOICE

EDUCATIONAL PROGRAMS

6B07192- Railway rolling stock

Level of education: bachelor course

Time of study: 3 years

Year of admission: 2025 y.

Mod ule	Cycle	Com pone nt	Name of the discipline	Total labor intensity		Semest er	Learning outcome	Brief description of the discipline	Prerequisites	Post-requisites	Depart ment
				in acade mic hours	in acade mic credits						
1		3	4	5	6	7	8	9	10	11	12
M5 - Module of economic and managerial competencies	GED	EC1	Ecological sustainable technologies	150	5	6	LR4	Discipline "Ecological sustainable technologies". technologies" studies modern methods and innovative solutions aimed at minimizing the negative impact of human activities on the environment. The course covers the principles of sustainable development, energy saving technologies, renewable energy sources, waste management strategies and environmentally friendly production processes.	Applied Physics, Engineering Mathematics 1,2	Labor protection, Life safety, Industrial practice 1,2, Final certification	MV &LS
	GED	EC2	Green economy and sustainable entrepreneurship				LR4 LR5	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 covers green economy concepts, ESG (Environmental, Social, Governance) approaches, circular economy, sustainable business models and their impact on global markets.	Engineering Mathematics 1,2, Sociology, Cultural Studies, Political Science, Psychology, History of Kazakhstan	Managerial Economics, Time Management, Production practice 1,2, Final certification	TLM

1	2	3	4	5	6	7	8	9	10	11	12
M5 - Module of economic and managerial competencies	GED	EC3	Fundamentals of Financial Literacy				LR5	The discipline is aimed at developing the ability to make informed financial decisions, plan income and expenses, assess risks and effectively manage their resources in a market economy. Studies basic knowledge in the field of finance and rational money management, discusses the concepts of the financial system, budget, banking products, lending, savings, investment, insurance, taxation and protection against financial fraud	Engineering Mathematics 1,2	Managerial Economics, Time management, Production practice 1,2, Final certification	TLM
	GED	EC4	Digital inclusion				LR1 LR3	RO3 discipline "Digital Inclusion" is dedicated to studying 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 to overcome them, technologies for adapting the digital environment, and government initiatives to develop an inclusive digital society.	Applied Physics, Engineering Mathematics 1,2, Sociology, Cultural Studies	IT technologies in transport, Production practice 1,2, Final certification	ICT
	GED	EC5	Fundamentals of scientific research				LR6	The discipline introduces the basics of scientific activity, covering its goals, methods and forms, contributing to the formation of theoretical knowledge and practical skills necessary for the successful conduct of scientific research in a chosen professional field, as well as developing the ability to independently search, analyze and apply scientific information, which becomes an important basis for further research and professional activities	Applied Physics, Engineering Mathematics, Theoretical Mechanics	Dynamics of locomotives, Information Technologies in Locomotive Management Automation of technological processes	SHD &PE
	GED	EC6	Fundamentals of law and anti-corruption culture				LR1	The discipline sets out the fundamental concepts of law, the constitutional structure of 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 if they are violated. The discipline provides students with an increase in public and individual legal awareness and legal culture, as well as a system of knowledge and civic position on combating corruption as an anti-social phenomenon.	Sociology, Cultural Studies, Political Science, Psychology, History of Kazakhstan	Production practice 1,2, Final certification	SHD &PE

1	2	3	4	5	6	7	8	9	10	11	12
M7-Professional module	BD	EC	The future of rail transport and its importance for sustainable development	120	4	1	LR5	The discipline forms the idea of railway transport as a strategically important industry that promotes sustainable development, territorial integration and social mobility. The key components of the transport system, its importance for the economy and society, historical stages and modern vectors of development are studied. The key digital and technological transformations of the industry, the role of the engineer of the future, and the importance of engineering thinking and management in the context of ensuring safety and meeting future requirements are considered.	Basic school education	disciplines PD Educational practice	RS
	BD	EC	Engineering profession in the railway industry of the future				LR5	The course is aimed at forming a holistic image of the profession of an engineering manager in the field of railway transport enterprises. The key trends of the industry are being studied: digitalization, transition to green energy, artificial intelligence. Through real success stories, professional tasks, role-playing cases and analysis of global challenges, students form a vision of their career and the value of technical thinking and an understanding of responsibility for compliance of engineering solutions with ethical and legal standards.	Basic school education	disciplines PD Educational practice	RS
M7-Professional module	BD	EC1	Heat engineering	120	4	3	LR2	Studies the basics of heat generation, conversion, transmission and use, thermodynamic cycles of heat engines and calculation of their parameters, types of heat exchange, heat exchangers and methods of their calculation, the principle of operation and design features of heat power plants, heat-using machines, aggregates, and devices. The discipline contributes to the analysis of energy-saving technology in transport and the determination of trends in the development of heat engineering machines, equipment, installations and devices.	Applied Physics, Engineering Mathematics 1,2,	Energy installations of transport equipment, Locomotive traction theory	RS

1	2	3	4	5	6	7	8	9	10	11	12
M7-Professional module	BD	EC2	Mechanics of liquid and gas, hydraulic and pneumatic drive	120	4	3	LR2	He studies the general laws and equations of fluid dynamics, modes of fluid motion and the basics of hydrodynamic similarity, laminar and turbulent fluid motion, hydraulic resistances, fluid flow through holes and nozzles, hydraulic calculation of pipelines, volumetric hydraulic machines, hydraulic drives and hydraulic automatics, pneumatic drive, pneumatic motor, pumps, hydraulic motors, fans, hydrodynamic gears, hydraulic drives metal cutting tools. The teaching methods are: problem solving, conducting thematic surveys, open and closed tests.	Applied Physics, Engineering Mathematics 1,2,	Energy installations of transport equipment	RS
M7-Professional module	BD	EC1	Fundamentals of calculating the strength of machines and mechanisms	150	5	3	LR6	Studies the basics of the theory of mechanisms and machines, material resistance, calculation and design of general-purpose parts and assemblies widely used in machines to solve problems aimed at improving reliability It is necessary to ensure the reliability and durability of parts and assemblies in the design , construction and operation, using modern educational and information technologies. Active learning methods – performing individual calculation and graphic tasks.	Applied Physics, Engineering Mathematics 1,2, Theoretical Mechanics	Machine parts and design fundamentals, Fundamentals of rolling stock reliability	MV&LS
	BD	EC2	Applied Mechanics				LR2	The discipline develops practical skills in applying the laws of theoretical mechanics and resistance of materials to calculate the strength, rigidity and stability of machine elements and engineering structures, as well as to analyze their movement and interaction under various types of loads, in order to further design of reliable and efficient technical systems.	Applied Physics, Engineering Mathematics 1,2, Theoretical Mechanics	Machine parts and design fundamentals, Fundamentals of rolling stock reliability	TS

1	2	3	4	5	6	7	8	8	10	11	12
M7-Professional module	BD	EC1	Rolling stock and railway infrastructure	180	6	3	LR5 LR10	Formation of professional competencies in the field of design and operation of the railway rolling stock fleet in interaction with railway infrastructure objects. Regulatory and technical base regulating requirements for railway rolling stock and railway infrastructure elements; track and track equipment economy; electric power supply of railways; design features of locomotives and wagons; locomotive and wagon economy; rules of technical operation; automation, telemechanics and communication on railways; organization of transportation and train movement.	Applied Physics, Engineering Mathematics 1,2, Structural materials in transport engineering, Theoretical mechanics	Energy installations of transport equipment, Locomotive Theory and Design, Dynamics of locomotives, Bases of reliability of the rolling stock, Organization of traffic safety and automatic brakes of locomotives,	RS
		EC2	Transport equipment and means of mechanization				LR5 LR10	The discipline studies the principles of operation, design features of transport equipment and means of mechanization, the main technical, operational, traction and energy characteristics, the role and significance of technical operation of various types of transport equipment. The discipline uses interactive teaching methods, conducting thematic surveys.	Applied Physics, Engineering Mathematics 1,2, Theoretical Mechanics	Energy installations of transport equipment, Locomotive Theory and Design, Bases of reliability of the rolling stock,	RS

1	2	3	4	5	6	7	8	8	10	11	12
M7-Professional module	BD	EC	Technical diagnostics of locomotives	180	6	5	LR3 LR8	The discipline develops competencies in forecasting the technical condition of rolling stock using digital platforms, AI and scientific analysis. Students will learn how to evaluate the reliability of elements, taking into account maintainability and environmental damage. The course is aimed at improving maintenance, increasing efficiency and reducing losses, contributing to the sustainable development of the locomotive complex and minimizing emissions of harmful substances.	Applied Physics, Engineering Mathematics 1,2, Structural materials in transport engineering, Locomotive Theory and Design,	Locomotive Repair Technology, Locomotive operation and maintenance, Information and documentation support for the conformity and life cycle of locomotives, Production practice 1, Industrial (pre-graduate) practice 2, Final certification	RS
		EC1	Methods of non-destructive testing of rolling stock				LR8, LR10	Study, analysis and classification of the causes of operational and technological defects of components and parts of rolling stock. Advanced methods of non-destructive testing and detection of rolling stock malfunctions are considered. Mastering and developing practical skills: working with modern diagnostic devices and flaw detectors; understanding and analyzing the results obtained. Training methods used: working with diagnostic equipment, group work, discussion.	Applied Physics, Engineering Mathematics 1,2, Structural materials in transport engineering, Locomotive Theory and Design,	Locomotive Repair Technology, Locomotive operation and maintenance, Information and documentation support for the conformity and life cycle of locomotives, Production practice 1, Industrial (pre-graduate) practice 2, Final certification	RS

1	2	3	4	5	6	7	8	9	10	11	12
M4-Module of information technologies and artificial intelligence	BD	EC1	Electric machines and electric drive	180	6	4	LR2 LR7	The processes of electromechanical energy conversion, principles of operation, characteristics and operational features of electric machines and electric drives are studied. Skills are being developed to: make an informed choice of electrical equipment with an emphasis on energy conservation, digitalization, compliance with standards and sustainable development; work with regulatory and technical documentation; model electromagnetic processes; develop technical justification for innovative engineering solutions and assess their safety. Interactive methods and elements of dual learning are used.	Electrical engineering and the basics of electronics, Applied Physics	Labor protection, Locomotive Electrical Transmissions, Locomotive electrical equipment and control automation	RS
		EC2	Electromagnetic technical means.				LR2 LR7	Studies the design, principle of operation, classification and characteristics of electric machines and transformers of general industrial use, equations of EMF, voltages, currents and moments, methods of starting and regulating the frequency of electric motors, physical working conditions, losses and efficiency factor. The discipline contributes to the analysis of technical solutions to improve performance and the application of engineering methods for calculating the parameters of electric energy converters. Interactive teaching methods, case tasks, problem solving, test tasks are used.	Electrical engineering and the basics of electronics, Applied Physics	Labor protection, Locomotive Electrical Transmissions, Locomotive electrical equipment and control automation	RS
7-Professional module	BD	EC1	Information Technologies in Locomotive Management	120	4	8	LR3, LR8	The discipline forms competencies in the application of digital technologies, software products and AI for monitoring, optimizing and visualizing the operational processes of rolling stock. Students will learn how to predict the technical condition of nodes, interpret operational data, and identify reserves for improving efficiency. The course focuses on management decisions aimed at reducing losses and rational use of resources, contributing to digital transformation and sustainable development of the industry.	Information Technologies in Locomotive Management, Basics of research, Organization and management of production, Production organization and enterprise management	Locomotive Repair Technology, Locomotive industry Production (pre-graduate) practice 2, Final certification	OmS URT
		EC1	Automation of technological processes				LR3	Competencies are being formed in the field of design, implementation and maintenance of automated production process management systems. The architecture and algorithms of automated systems, modeling and control of technical processes using specialized software are studied. Elements of AI for adaptive control are being mastered. The approach is focused on sustainable development through digitalization, energy efficiency, loss reduction and increased reliability of operational systems. Elements of scientific research methods are used: system analysis, modeling and justification of engineering solutions.	Information Technologies in Locomotive Management, Basics of research, Organization and management of production, Production organization and enterprise management	Locomotive Repair Technology, Locomotive industry Production (pre-graduate) practice 2, Final certification	OmS URT

1	2	3	4	5	6	7	8	9	10	11	12
M4-Module of information technologies and artificial intelligence	BD	EC1	Dynamics of locomotives	120	4	8	LR3 LR6	Dynamic processes in the locomotive–path system under various types of disturbances are studied. Competencies are being formed for calculating the dynamic characteristics of locomotives, criteria for safe movement, determining the optimal parameters of locomotive running gear, dynamic strength tests of locomotives using software tools (Mathcad, SolidWorks, Universal Mechanism), calculating applied problems of locomotive dynamics based on AI algorithms. Elements of scientific research methods are used: system analysis, modeling and justification of engineering solutions.	Applied Physics, Engineering Mathematics 1,2, Digital engineering management, Locomotive Theory and Design, Information Technologies in Locomotive Management, Basics of research	Industrial (pre-graduate) practice 2, Final certification	OmS URT
		EC2	IT technologies in transport				LR3	Studies the principles of forming information flows, managing information flows in transport systems of different levels of complexity, general principles of building intelligent transport systems (ITS), routing transport and monitoring its operation when using ITS, design of information systems, organization of information exchange between control objects, methods of automated identification of transport objects, methods of location determination, application of information technology in the design of vehicles.	Information Technologies in Locomotive Management, Python programming basics, Applied Physics, Engineering Mathematics 1,2, Electrical engineering and fundamentals of electronics, Engineering graphics and computer modeling		

1	2	3	4	5	6	7	8	9	10	11	12
M5 - Module of economic and managerial competencies	BD	EC1	Managerial economics	90	3	6	LR5	Formation of the conceptual framework and development of economic analysis skills using modern models and patterns of economic science, consideration of economic problems and tasks facing the head of the company. Studying this discipline will allow students to gain and develop knowledge in the field of analytical research of economic, technological and technical parameters of the enterprise, as well as to master the skills of applying special methods of economic justification of management decisions and assessing their consequences.	Engineering Mathematics 1,2, Fundamentals of financial literacy, Green economy and sustainable entrepreneurship	Organization and management of production, Production organization and enterprise management, Digital engineering management	TLM
		EC2	Time management				LR5	discipline studies a system of methods, tools and approaches that are aimed at effective time management in order to achieve set goals. The course is designed to improve the skills of organizing and optimizing the use of working time, increase productivity, reduce stress, plan, delegate, use tools and technologies, and know your time and energy rhythms in order to use your time effectively.	Engineering Mathematics 1,2, Fundamentals of financial literacy, Green economy and sustainable entrepreneurship	Organization and management of production, Production organization and enterprise management, Digital engineering management	TLM

1	2	3	4	5	6	7	8	9	10	11	12
M5 - Module of economic and managerial competencies	BD	EC1	Organization and management of production	120	4	7	LR5	The discipline lays the fundamental principles of organizing production processes in industrial enterprises. It covers the structure of a production enterprise, types of production, and methods for planning and rationing labor and resources. Basic principles of quality management, analysis of production and economic indicators, and labor safety are examined. Primary competencies are formed for the subsequent study of industry-specific production systems.	Managerial economics, Time management	Locomotive industry, Locomotive Repair Technology, Information Technologies in Locomotive Management, Automation of technological processes	OmS URT
		EC2	Production organization and enterprise management				LR5	The discipline reveals the basics of the organization of production processes and enterprise management, taking into account modern requirements of sustainable development. Methods of planning, rationing, risk analysis, quality management, decision-making and ensuring compliance of products and processes with standards are mastered. Digital optimization tools, automation elements, production and economic indicators and approaches to increase efficiency, reduce losses and rational use of resources in industrial practice are considered.			

1	2	3	4	5	6	7	8	9	10	11	12
M4 - Module of information technologies and artificial intelligence	PD	EC1	Locomotive electrical equipment and control automation	150	5	7	LR3 LR7	This course covers the operating principles and diagnostics of locomotive electrical and electronic systems, including automated control and energy-saving tools. Competencies are developed in applying AI, digital platforms, and data analytics to enhance reliability and environmental friendliness. The focus is on risk management, technological resilience, and innovation within the industry's digital transformation.	Locomotive Theory and Design, Electrical engineering and the basics of electronics, Python programming basics, Electric machines and electric drive, Electromagnetic technical means	Automation of technological processes, Locomotive industry	OmS URT
		EC2	Digital engineering management				LR3 LR5	Digital approaches to managing engineering processes of the wagon and locomotive complex are studied, including analysis of operational data, modeling and risk assessment. Skills in digital design, quality and resource management are formed. Methods of scientific analysis and digital platforms are applied. The emphasis is on management decisions, improving efficiency, sustainable development and digital transformation of the industry.	Information Technologies in Locomotive Management, Locomotive Theory and Design, Electrical engineering and fundamentals of electronics	Automation of technological processes, Locomotive industry	OmS URT

1	2	3	4	5	6	7	8	9	10	11	12
M4 - Module of information technologies and artificial intelligence	PD	EC1	Locomotive Microprocessor Control Systems	120	4	7	LR7 LR10	This course covers the principles of design, operation, and integration of microprocessor systems in locomotive control, including intelligent diagnostic modules, AI algorithms, and digital platforms. It develops skills in analyzing operational risks, assessing reliability, and adapting systems to climatic and infrastructural conditions, while considering sustainable development and the demands of digital transformation.	Information Technologies in Locomotive Management, Electrical engineering and the basics of electronics, Technical diagnostics of locomotives, Python programming basics	Locomotive industry, Locomotive Repair Technology	OmS URT
		EC2	Information and documentation support for the conformity and life cycle of locomotives				LR8 LR9 LR10	Study of the regulatory and technical framework and procedures for assessing the conformity of locomotives. Competencies for working with technical, repair and accompanying documentation of the life cycle are being formed. The basics of conformity assessment and identification methods are considered. Information systems and digital tools for documentation management, compliance control, and information support for operation and repair are being mastered.	Information Technologies in Locomotive Management, Technical diagnostics of locomotives, Methods of nondestructive control of the rolling stock	Locomotive industry, Locomotive Repair Technology	OmS URT

1	2	3	4	5	6	7	8	9	10	11	12
M9-Sustainable development and standards in transport engineering/Module of the additional educational	PD	EC1	Design and calculation of components and parts of rolling stock	90	3	7	LR10	PO3 PO6 PO8 Methods of engineering analysis, strength calculations and selection of materials for rolling stock components are mastered using modern CAD/CAE/CAM systems (SolidWorks, MathCAD, COMPASS-3D). Digital competencies are being developed in the field of parametric modeling, visualization and optimization of structures with an emphasis on resource conservation, environmental friendliness and the use of IT tools at all stages of the product life cycle. Elements of scientific research methods are used: system analysis, modeling and justification of engineering solutions.	BD and PD disciplines	Production practice, Final certification	OmS URT
		EC2	Minor program 1				LR1	The first of three disciplines, which allows you to form additional professional competencies in various subject areas.	BD and PD disciplines	Production practice, Final certification	OmS URT
		EC1	Resource saving in transport	90	3	8	LR10	Study of the main types and characteristics of energy resources, regulatory support for energy saving, improving the energy efficiency of the transportation process; energy-saving technologies in repair production and operation of transport infrastructure facilities; organization and methods of energy saving management. It is used to solve problems, conduct thematic colloquiums, debates. Guest lectures are being held by leading experts of the transport and communication industry.	BD and PD disciplines	Production practice, Final certification	OmS URT
		EC2	Minor program 2				LR3	is the second of three disciplines that allows you to form additional professional competencies in various subject areas.	BD and PD disciplines	Production practice, Final certification	OmS URT
		EC1	Technical rationing and legal aspects of rolling stock	90	3	9	LR9	Regulatory and legal bases for ensuring safe, efficient and environmentally sustainable operation of rolling stock are studied. Methods of technical regulation, risk assessment and legal regulation in the transport industry are being developed. Competencies are formed in the field of compliance with the requirements of technical documentation, standards and legislation. Approaches to sustainable life cycle management of railway rolling stock are analyzed.	BD and PD disciplines	Production practice, Final certification	OmS URT
		EC2	Minor program 3				LR5	The third of the three disciplines, which allows you to develop additional professional competencies in various subject areas.	BD and PD disciplines	Production practice, Final certification	OmS URT
			Total	2130	71						

Acting Head of the Rolling Stock Department

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