

AGREED  
 Director of the branch «Wagon-wheel  
 workshops of Almaty-1 station» of  
 «Kamkor Wagon» LLP  
 Zhasokbai R.G.  
 2023 y.



«Логистика және көлік академиясы» АҚ  
 «Көлік инженерия» институты  
 APPROVED  
 Director of the Institute  
 «Transport Engineering»  
 Chigambayev T.O.  
 Институт «Транспортна инженерия»  
 2023 y.

CATALOG OF ELECTIVE COMPONENT DISCIPLINES

EDUCATIONAL PROGRAM

6B07116 - WAGONS

Level of education: Bachelor's degree

Time of study: 4 years

Year of admission: 2023 y.

Module	Cycle	Component	Name of discipline	Total labor input		Semester	Learning outcomes	Brief description of the discipline	Prerequisites	Post requisites	Department
				in academic hours	in academic credits						
1	2	3	4	5	6	7	8	9	10	11	12
Module 1 – General education disciplines	GED	EC1	Ecology and life safety	150	5	3	ON5	The study of the basic environmental concepts, environmental problems and approaches to their solution, sources and types of environmental pollution by enterprises, the principles of standardizing the quality of atmospheric air and water, the main provisions of legislation in various fields, natural and man-made emergencies, their causes, methods of prevention and protection . Teaching methods - analysis of specific situations (case-study).	Basic school education in ecology	Labor protection, Ensuring traffic safety on transport	MV&LS
		EC2	Scientific research methods				ON2, ON3	Obtaining theoretical and applied knowledge by students on the methods of scientific research of problems in the field of study, training of specialists with the skills of cognitive activity in the field of science, the formation of deep ideas about the content of scientific activity, its methods and forms of knowledge.	Engineering Mathematics, Applied Physics	Dynamics of wagons, Methods of nondestructive control of the rolling stock	SHD & PE

1	2	3	4	5	6	7	8	9	10	11	12
Module 1 – General education disciplines	GED	EC3	Basics of economics and entrepreneurship	150	5	3	ON6	He studies the activities of enterprises in various types of markets, the model of equilibrium and functioning of the market, state regulation of prices and tariffs. Considers the concept of entrepreneurship and the limits of its legal regulation, the conditions for the development of entrepreneurship, organizational and legal forms of doing business, business planning, entrepreneurial secrecy, social responsibility of. Active learning methods: case methods; business role-playing games, group work.	Engineering Mathematics	Managerial Economics, Time -management, Resource saving in transport, Transport logistics	TLM
		EC4	Basics of law and anti-corruption culture				ON1	Improving the public and individual legal awareness and legal culture of students, as well as the formation of a system of knowledge and civil position to combat corruption as an anti-social phenomenon. As a result of studying the course, the student must master 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 the legitimate interests of a person in case of their violation.	Sociology, Political Science, Psychology, Cultural Studies, History of Kazakhstan	Final certification	SHD & PE
Module 7 – General engineering competencies	BD	EC1	Fundamentals of calculating the strength of machines and mechanisms	180	6	4	ON7	Studies the basics of the theory of mechanisms and machines, the resistance of materials, calculation and design of general-purpose parts and assemblies widely used in machines to solve problems aimed at improving the reliability, strength and durability of parts and assemblies in design, construction and operation, using modern educational and information technologies. Methods of active learning – performing individual computational and graphical tasks.	Engineering Mathematics, Applied Physics, Theoretical mechanics, Structural materials in transport engineering	Machine parts and design basics, Design of wagons. Of the automatic wagons and the safety of train movement, Fundamentals of rolling stock design, Principles of computer-aided design of wagons	SE
		EC2	Applied Mechanics				ON7	Studies the theoretical foundations and methods of calculations for strength, rigidity, durability and stability of structural elements of transport structures, the main types of mechanisms, parts and assemblies of machines, general principles of design and construction, which is necessary when assessing the reliability of existing equipment in operating conditions. Methods of active learning – performing individual computational and graphical tasks.	Engineering Mathematics, Applied Physics, Theoretical mechanics, Structural materials in transport engineering	Machine parts and design basics, Design of wagons. Of the automatic wagons and the safety of train movement, Fundamentals of rolling stock design, Principles of computer-aided design of wagons	SE

1	2	3	4	5	6	7	8	9	10	11	12
Module 2 - Natural science competencies	BD	EC1	Heat engineering	180	6	3	ON2	Studies the basics of obtaining, converting, transferring and using heat, 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, 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.	Engineering Mathematics, Applied Physics	Life support systems for passenger cars, Of the automatic wagons and the safety of train movement	RS
		EC2	Fluid and gas mechanics, hydroand pneumatic drive				ON2	General laws and equations of hydrodynamics, fluid motion modes and fundamentals of hydrodynamic similarity, laminar and turbulent fluid motion, hydraulic barriers, fluid flow through nozzles and nozzles, hydraulic calculation of pipelines, volumetric hydraulic machines, hydraulic drives and Hydraulic automation, pneumatic drive, pneumatic motor, pumps, hydraulic motors, fans, hydrodynamic transmission, hydraulic drive drives are metal-cutting tools. Teaching methods: problem solving, conducting thematic surveys, open and closed tests.	Engineering Mathematics, Applied Physics	Life support systems for passenger cars, Of the automatic wagons and the safety of train movement	MV & LS
Module 10 - Reliability, diagnostics and repair of wagons	BD	EC1	Methods of nondestructive control of the rolling stock	270	9	5	ON9, ON11	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 fault detection of rolling stock are considered. Mastering and practicing practical skills: working with modern diagnostic devices and flaw detectors; understanding and analyzing the results. Training methods used: work with diagnostic equipment, group work, discussion.	Engineering Mathematics, Applied Physics	Bases of reliability of the rolling stock, Technology repair wagons, Equipment and technology of welding and surfacing works	RS
		EC2	Theory of automatic control				ON2, ON11	Formation of knowledge, skills and abilities of building automatic control systems based on modeling methodology using modern technologies and basic natural science laws. It consists of the following modules: fundamentals of automation of technological processes, the main tasks of the theory of automatic control, mathematical models of automatic control systems, research methods of linear non-linear automatic control systems, random impacts in linear automatic control systems, optimal control problems, current trends in the development of automatic control systems. Interactive teaching methods are used.	Engineering Mathematics, Applied Physics, Electrical engineering and the basics of electronics	Technology repair wagons, Automation and mechanization of repair of wagons, Automation of technological processes	RS

1	2	3	4	5	6	7	8	9	10	11	12
Module 4 -IT competencies	BD	EC1	Dynamics of wagons	180	6	6	ON4, ON10, ON12	General ideas about classical and modern approaches to the study of the causes of carriage fluctuations are given. The methodology for determining the coefficients of dynamics and stability margin when moving a car in straight and curved sections of the railway track, the establishment and justification of criteria for the safe movement of rolling stock. Computational and analytical methods are used to solve problems related to determining the dynamic characteristics of freight and passenger cars. They are used by the "Universal Mechanism" software, Mathcad.	Engineering Mathematics, Applied Physics, Theoretical mechanics, Rolling stock and railway infrastructure, Transport equipment and means of mechanization, Design of wagons	Principles of computer-aided design of wagons PowerBI Business Analytics, Final certification	RS
		EC2	IT technologies in transport				ON4, ON12	Studies the principles of information flow formation, information flow management in transport systems of various levels of complexity, general principles of building intelligent transport systems (ITS), routing of transport and monitoring of its operation when using ITS, information system design, organization of information exchange between management objects, methods of automated identification of transport objects, methods of location determination, application of information technology in the construction of vehicles. Methods of active learning: computer modeling, project method, work in small groups. It is used by: Mindmap, Python, MSPowerBI, Wialon system.	Information and communication technologies, Fundamentals of computer modeling, Rolling stock and railway infrastructure, Transport equipment and means of mechanization Foreign language	Principles of computer-aided design of wagons PowerBI Business Analytics, Final certification	ICT
Module 11 - Operation of wagons	BD	EC1	Ensuring traffic safety on transport	180	6	6	ON5, ON12	Acquisition by students of knowledge, principles, conditions and methods of ensuring the safety of vehicles in accident-free operation, instilling skills of an integrated approach to solving transport security problems, including in non-standard situations. As part of the study of the discipline, interactive methods are used, the solution and analysis of situational problems, discussions, guest lectures by leading top managers of transport companies.	Rolling stock and railway infrastructure, Transport equipment and means of mechanization	Bases of reliability of the rolling stock, Final certification	OT& OT

1	2	3	4	5	6	7	8	9	10	11	12
Module 11 - Operation of wagons	BD	EC2	Organization of operational work of the railway section	180	6	6	ON5, ON12	Study of the organization of the work of railway sections, dispatching personnel of railways, technical rationing of operational work and regulation of car traffic, locomotive and wagon fleets, rationing of work and rest of locomotive crews. Formation of skills for determining the operated fleet and calculating the operational indicators of the use of locomotives, operational planning of train and freight work of the road. As part of the discipline, demonstration of video clips is practiced, field classes are organized on the basis of the Almaty branch of the railway, Almaty-1, Almaty-2 stations.	Rolling stock and railway infrastructure, Transport equipment and means of mechanization	Bases of reliability of the rolling stock, Inclusive transport infrastructure, Management of wagon operation processes, Final certification	OT& OT
Module 9 - Design of wagons	BD	EC1	Rolling stock and railway infrastructure	270	9	4	ON10, ON12	Formation of professional competencies in the field of construction and operation of a fleet of railway rolling stock in interaction with railway infrastructure facilities. Regulatory and technical base regulating requirements for railway rolling stock and elements of railway infrastructure; track and track facilities; railway power supply; design features of locomotives and wagons; locomotive, wagon facilities; rules technical operation; automation, telemechanics and communication on the railway; organization of transportation and train traffic.	Engineering Mathematics, Applied Physics, Structural materials in transport engineering, Theoretical mechanics	Design of wagons, IT technologies in transport, Ensuring traffic safety on transport, Of the automatic wagons and the safety of train movement, Dynamics of wagons	RS
		EC2	Transport equipment and means of mechanization				ON10, ON12	The discipline studies the principles of operation, design features of transport equipment and means of mechanization, basic 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.	Engineering Mathematics, Applied Physics, Structural materials in transport engineering, Theoretical mechanics	Design of wagons, IT technologies in transport, Ensuring traffic safety on transport, Of the automatic wagons and the safety of train movement, Dynamics of wagons	MV & LS

1	2	3	4	5	6	7	8	9	10	11	12
Module 10 - Reliability, diagnostics and repair of wagons	PD	EC1	Equipment and technology of welding and surfacing works	180	6	6	ON9, ON11	Formation of skills: determining the most modern and rational methods of restoring parts by welding / surfacing; performing calculations of the characteristics of welding and surfacing processes; designing technological processes of welding and surfacing works. It consists of the following modules: technology and quality control of welding and surfacing, the concept of quality and reliability of welded structures; repair and restoration of wagon parts by welding and surfacing; equipment used in welding and surfacing. Interactive teaching methods, elements of dual training are used.	Engineering Mathematics, Applied Physics, Electrical engineering and the basics of electronics, Methods of nondestructive control of the rolling stock	Automation of technological processes, Life support systems for passenger cars, Technology repair wagons, Automation and mechanization of repair of wagons	RS
	PD	EC2	Inclusive transport infrastructure	180	6	6	ON10, ON12	General ideas about the creation of accessibility at transport infrastructure facilities and rolling stock for people with disabilities and people with limited mobility (disabled). Study of the requirements of state, regulatory and project documentation in the field of an inclusive environment for people with limited mobility. The best practices of technologically developed countries in the field of creating an inclusive space at transport infrastructure facilities and ensuring equal opportunities for people with limited mobility and the disabled.	Rolling stock and railway infrastructure, Transport equipment and means of mechanization	Fundamentals of rolling stock design, Final certification	RS
Module 9 - Design of wagons	PD	EC1	Management of wagon operation processes	270	9	8	ON6, ON11, ON12	The content of the discipline is based on the requirements of regulatory and technical documents in the field of operation of wagons and ensuring transport safety on the railways of the Republic of Kazakhstan. It consists of the following modules: material and technical base and management of operational enterprises; requirements for reliability indicators of wagons; system, organization of works and technology of maintenance of wagons; calculations of indicators of the use of wagons in operation; modern methods of optimization of production. Interactive teaching methods are used, as well as elements of dual training.	Design of wagons, Rolling stock and railway infrastructure, Transport equipment and means of mechanization	Final certification	RS
		EC2	Principles of computer-aided design of wagons				ON4, ON7, ON10	Mastering theoretical knowledge and practical skills in the field of wagon design by students. Obtaining skills in using software systems and computer-aided design of components and parts of freight and passenger cars. Study of the requirements of regulatory and technical and design documentation in the field of designing modern railcars using methodological foundations, hardware and computer-aided design systems (CAD and CAD applications: AutoCAD, COMPASS 3D, etc.).	Design of wagons, Rolling stock and railway infrastructure, Transport equipment and means of mechanization	Final certification	RS

1	2	3	4	5	6	7	8	9	10	11	12
Module 9 - Design of wagons	PD	EC1	Life support systems for passenger cars	180	6	7	ON9, ON10, ON11, ON12	Formation of skills of diagnostics and technical calculation of life support systems of passenger cars of various types, in order to determine their optimal characteristics, for rational practical application in operation. Study of: modern designs of life support systems for passenger cars, their rational technical and technological solutions; regulatory and technical documentation for maintenance and repair of life support systems for passenger cars. Interactive teaching methods, elements of dual training are used.	Engineering Mathematics, Applied Physics, Теплотехника, Fluid and gas mechanics, hydroand pneumatic drive, Design of wagons, Rolling stock and railway infrastructure, Transport equipment and means of mechanization, Fundamentals of calculating the strength of machines and mechanisms, Methods of nondestructive control of the rolling stock	Automation and mechanization of repair of wagons, Final certification	RS
		EC2	Automation of technological processes				ON4, ON11	The discipline forms the ability to solve problems of automation of production processes using modern technical means. Studies automated process control systems; information systems of automated process control systems; fundamentals of modeling of technological objects, controlled automated process control systems; structure and algorithms of process control, software control systems of production installations.	Rolling stock and railway infrastructure, Transport equipment and means of mechanization, Fundamentals of calculating the strength of machines and mechanisms, Fundamentals of rolling stock design	Principles of computer-aided design of wagons, Automation and mechanization of repair of wagons, Final certification	RS
Module 6 – Economic and managerial competencies	PD	EC1	Managerial Economics	90	3	5	ON6	Formation of the conceptual apparatus and development of economic analysis skills using modern models and laws of economic science, consideration of economic problems and tasks facing the head of the company. The study of this discipline will allow students to gain and develop knowledge in the field of analytical research of economic, technological and technical parameters of an enterprise, and will also allow them to master the skills of applying special methods of economic justification of management decisions and assessing their consequences. Active learning methods are used - situational tasks, case method.	Engineering Mathematics, Basics of economics and entrepreneurship	Management of wagon operation processes	TLM
		EC2	Time - management				ON6	Formation of students' general ideas about the essence and types of time management, principles and methods of time resource management for more successful professional activities. Active learning methods are used - situational tasks, case method.	Basics of economics and entrepreneurship	Management of wagon operation processes, Transport logistics	TLM

1	2	3	4	5	6	7	8	9	10	11	12
Module 7 – General engineering competencies	PD	EC1	Transport logistics	90	3	6	ON6	The study of the main provisions of transport support of logistics systems, activities in the field of transportation, covering the entire range of operations and services for the delivery of goods from the manufacturer of products to the consumer, the principles of design and construction of logistics systems. Mastering the skills of optimization and organization of rational cargo flows, their processing in specialized logistics centers, ensuring an increase in their efficiency, reducing unproductive costs and expenses. The teaching methods are: solving problems, conducting thematic colloquiums, seminars "brainstorming". Within the framework of the discipline, guest lectures are conducted by leading specialists of transport and logistics companies.	Basics of economics and entrepreneurship, Managerial Economics, Time -management	Management of wagon operation processes, PowerBI Business Analytics	TLM
		EC2	Fundamentals of rolling stock design				ON4, PO12	Systematize traditional methods and modern software systems for automated design of wagons and locomotives. Determine the optimal parameters of the rolling stock and its linear dimensions. Apply modern methods of developing design documentation when designing components and parts of CAD rolling stock and CAD applications: QCAD, FreeCAD, etc.).	Machine parts and design basics, Information and communication technologies	Design of wagons, Principles of computer-aided design of wagons	RS
Module 7 – General engineering competencies	PD	EC1	Resource saving in transport	90	3	7	ON11, PO12	The study of the main types and characteristics of energy resources, regulatory and legal support for energy conservation, improving the energy efficiency of the transportation process; energy-saving technologies in repair production and operation of railway infrastructure facilities; organization and methods of energy conservation management. They are used to solve problems, conduct thematic colloquiums, debates. Guest lectures are being held by leading experts of the transport and communication industry.	Organization of operational work of the railway section, Production practice 1, 2	Management of wagon operation processes, Final certification	RS
		EC2	PowerBI Business Analytics				ON4, ON6	Formation of students' skills and knowledge to collect, analyze and structure data in order to build interactive dashboards, program at the modern level of development of the MDX multidimensional data analysis language, build models and algorithms of projects in relevant areas of BI technology, be able to analyze the essence of the project subject field and make decisions. Methods of active learning are used - brainstorming, working in small groups. The form of control is an individual project.	Information and communication technologies, IT technologies in transport, Dynamics of wagons	Final certification	ICT
<b>Total</b>				<b>2310</b>	<b>77</b>						

Head of the Department «Rolling stock»

Ashirbayev G.K.