



**School of transport engineering and logistics named after M. Tynyshpayev
The direction of «Transport engineering»**

EDUCATIONAL PROGRAM

6B07124 – «Technology of production, repair and operation of locomotives»

Code and classification of the field of education:	6B07 – Engineering, manufacturing and construction industries
Code and classification of training directions:	6B071 – Engineering and Engineering affairs
Group of educational programs:	B065 – Transport equipment and technology
Level based on NQF:	6
Level based on IQF:	6
Study period:	4 year
Amount of credits:	240

Almaty 2025

Educational program 6B07124 – «Technology of production, repair and operation of locomotives» was approved at the meeting of K.I. Satbayev KazNRTU Academic Council.

Protocol № 10, dated March 6, 2025.

Was reviewed and recommended for approval at the meeting of K.I. Satbayev KazNRTU Educational and Methodological Council

Protocol № 3, dated December 20, 2024.

Educational program 6B07124 – «Technology of production, repair and operation of locomotives» was developed by Academic committee based on direction 6B071 – Engineering and Engineering affairs

Full name	Academic degree/ academic title	Position	Workplace	Signature
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List of abbreviations and designations

KazNRTU named after K.I. Satbayev – Kazakh national research technical university named after K.I. Satbayev;

EP – Educational program;

TE – Transport Engineering

WC – Working curricula

SDG – Sustainable Development Goals;

LO – Learning outcomes;

USDD – Unified System of Design Documentation;

ESG – Environmental, Social, Governance;

IP – intellectual property;

LTCRM- lifting-transport, constructive and road machines;

CES – catalog of elective subjects;

UC – university component;

CC – component of choice;

NQF – National Qualifications Framework;

SQF – Sectoral Qualifications Framework;

TVET – Technical and Vocational Education;

MURS – multiple unit rolling stock

ACS EDT – Automated Control System «Energy Dispatcher Traction»

FER – fuel and energy resources.

1. Description of educational program

The educational program 6B07124 – «Technology of production, repair and operation of locomotives», within the field of study 6B071 – 6B071 – Engineering and Engineering affairs, is aimed at training highly qualified specialists in the production, operation, and maintenance of locomotives and multiple-unit rolling stock. Graduates are expected to be aware of their professional responsibility for the outcomes of their activities with respect to society, the environment, and future generations.

This educational program is designed in accordance with four fundamental principles of sustainable human development and integrates key Sustainable Development Goals (SDGs).

The following key objective can be highlighted:

«Quality Education».

The program is aimed at developing in-depth knowledge and research skills necessary to address technical and technological challenges in the field of sustainable land transport. A student enrolled in this educational program will be capable of utilizing every opportunity for lifelong learning and applying the acquired knowledge in everyday situations to contribute to sustainable development. (SDG4)

«Industry, Innovation and Infrastructure»

The program fosters the development of the following competencies in students: the ability to motivate their environment to transition toward more sustainable and stable forms of transport infrastructure; the ability to implement innovative technologies to minimize environmental impact and ensure energy-efficient consumption; and the ability to assess the effects of transport systems and technological processes on human health and the environment as a result of harmful emissions and acoustic pollution. (SDG 9).

«Responsible Consumption and Production».

The program supports the development of the following competencies in students: the ability to make technical, organizational-economic, and managerial decisions based on the goals of sustainable development; and the ability to promote the dissemination of sustainable production models (SDG12).

«Climate Action».

The program fosters the development of the following competencies in students: the ability to assess how climate-safe their everyday and professional activities are and to adjust them accordingly if necessary; the ability to act in the interest of people affected by climate change; and the ability to forecast, calculate, and evaluate the long-term impact of decisions and actions made by themselves, as well as at the local and national levels, on other people and regions around the world. (SDG 13)

The educational program is developed based on the Sectoral Qualifications Framework in the field of "Railway Transport" in accordance with the following Professional Standards:

- Operation of locomotives and multiple-unit rolling stock;

- Quality control of locomotives after repair;
- Management and safety control of railway transport operations.

The Professional Standards «Technical operation, maintenance, and repair of locomotives and multiple-unit rolling stock» and «Manufacturing and production of locomotives and multiple-unit rolling stock» have not yet been developed.

The distribution of railway industry workers by job groups according to the Sectoral Qualifications Framework is presented in Table 1.

Table 1 – Distribution of railway industry workers by job categories

Group	Education Level Required	Qualification Level according to SQF
Top-level executives	Higher or postgraduate education	7,8
Managers	Higher or postgraduate education	5,6,7
	TVET (Technical and Vocational Education)	5
Specialists	Higher or postgraduate education	5,6
	TVET (Technical and Vocational Education)	4,5
Office staff	Higher or postgraduate education	5
	TVET (Technical and Vocational Education)	4,5
	Secondary education	3
Workers	TVET (Technical and Vocational Education)	4
	Secondary education	2,3

Professional Field: Railway Transport, Transport Equipment and Technologies

The objects of professional activity of students include:

- Divisions of industrial enterprises involved in the production, operation, maintenance, and repair of locomotives and multiple unit rolling stock;
- Divisions of government institutions responsible for the operation, maintenance, and repair of locomotives and multiple unit rolling stock;
- Divisions of design organizations engaged in the design, manufacturing, and technical support of innovative rolling stock;
- Divisions of research organizations conducting studies in the field of production, operation, maintenance, and repair of locomotives and multiple unit rolling stock.

Types of Professional Activities:

- Production and Technological;
- Organizational and Managerial;
- Service and Operational;
- Repair and Technological.

Functions of professional activity:

1. Organization of operation, maintenance, and diagnostics of locomotives; monitoring of safe operation;

2. Development and implementation of innovative technological processes for maintenance and repair; application of standard methods for calculating the reliability of locomotive components;
3. Management of production processes; analysis of production performance, including environmental indicators, safety, and energy efficiency;
4. Supervision of inspection and repair work of locomotives and monitoring of compliance with safety regulations;
5. Quality control of all types of locomotive repairs; monitoring the availability, condition, and use of measuring and control equipment;
6. Analysis and assessment of production and non-production costs or resources for high-quality maintenance and scheduled repairs;
7. Development of new technologies; preparation of design and technological documentation using computer technologies;
8. Strength and stability calculations under various types of loading; design of machines using design principles and methods; selection of materials for manufacturing machine parts; justification of technical solutions;
9. Development of technical specifications and requirements for the design of technological machines, locomotives or their components, technological processes, and automation tools using information technologies and software with improved environmental and economic performance;
10. Design of innovative locomotive models, their components, units, equipment, technological processes, automation and protection tools that meet the latest achievements of science and technology, safety requirements, and the goals of sustainable development.

Functions and key competencies of professional activity are presented in Table2.

Table 2. Job Functions and Professional Skills/Competencies (according to Professional Standards)

Position	Job Functions	Professional Skills/Competencies
1. Chief Specialist / Safety Engineer (by levels)	1. Monitoring compliance with traffic safety requirements during the execution of technological processes. 2. Control over the timely elimination of identified violations and discrepancies with regulatory and technical documentation. 3. Risk management related to traffic safety within the area of responsibility.	1. Work in a coordinated and coherent manner with employees of other structural units, understanding their needs and the specifics of their work. 2. Participate in the development of measures aimed at ensuring and preventing traffic safety violations. 3. Apply various methods to improve the level of traffic safety. 4. Use technical and other tools for receiving and/or transmitting information during work duties, including computers, copying and duplicating equipment,

Position	Job Functions	Professional Skills/Competencies
		communication systems, databases, and information resources.
2. Safety Engineer-Technologist / Inspector	1. Maintaining safety department records in compliance with local regulations Preparing investigation materials for identified: – Safety violations – Work defects – Non-compliance with labor/performance discipline Generating reports on execution of: – Telegraph directives – Protocol decisions	1. Maintaining systematic records of outgoing documents from safety department personnel 2. Processing and dispatching via electronic document management system: – Telegraph directives – Protocol decisions – Official orders – Service letters – Reports – To car and locomotive depots 3. Processing and dispatching via correspondence: – Telegraph directives – Protocol decisions – Official orders – Service letters – To car and locomotive depots 4. Conducting official correspondence regarding train safety matters
3. Senior Depot Controller / Turnaround Locomotive Depot Controller	1. Supervise the work of all duty officers at the depot. 2. Monitor the timely release of locomotives after technical servicing. 3. Organize the placement of locomotives for maintenance and repair, and the release of locomotives for train operations according to the locomotive turnaround schedule. 4. Operate within information-analytical automated systems to manage and control the shift-daily work plan. 5. Issue route documentation for train drivers. 6. Maintain the TU-1 form desktop journal.	1. Make operational decisions related to the shift-daily work plan and its implementation by duty officers. 2. Analyze data on the execution of the shift-daily plan. 3. Work effectively within automated information and analytical systems used for depot planning and management. 4. Allocate the locomotive and multiple unit rolling stock (MURS) fleet by types of operations. 5. Make decisions regarding the release of locomotives and MURS from maintenance and repair. 6. Oversee proper maintenance of the TU-1 form journal. 7. Compare and analyze information on the availability and condition of locomotives (MURS), and locomotive crew operations. 8. Apply various methods to enhance railway traffic safety.

Position	Job Functions	Professional Skills/Competencies
		9. Identify all types of locomotive equipment malfunctions.
4. Thermal Engineer of Locomotive Crews	1. Development of technical standards for fuel and energy resources (FER) consumption. 2. Operation within the Automated Control System “Energy Dispatcher Traction” (ACS EDT). 3. Preparation of technical and administrative documentation.	1. Perform traction calculations considering different locomotive series and serviced routes. 2. Determine the consumption of diesel fuel by diesel locomotives and electrical energy by electric locomotives. 3. Develop energy consumption norms for train traction. 4. Determine the train handling mode for specific sections. 5. Use computer graphic software tools. 6. Process alarm activation data from the ACS EDT. 7. Prepare an analysis of FER (Fuel and Energy Resources) consumption for train traction. 8. Develop and justify proposals to the supervisor for the improvement and efficient use of FER (Fuel and Energy Resources).
5. Head of Locomotive Reserve Base	1. Organize operations of the locomotive reserve base to ensure: – Timely execution – Quality maintenance – Proper preservation of locomotives for long-term storage 2. Monitor workplace safety compliance	1. Make decisions to improve locomotive maintenance quality 2. Implement best practices in locomotive maintenance organization 3. Ensure efficient use of materials for repair works 4. Effectively communicate technical information and provide methodological support for: – Locomotive maintenance knowledge acquisition – Multiple Unit Rolling Stock (MURS) maintenance procedures
6. Lead Engineer, Locomotive Repair Control Department	1. Monitoring the wear of wheel flanges and tires. 2. Preparing and submitting reports to the central office.	1. Analyze the roll-outs of wheel-motor blocks. 2. Analyze the condition of wheelset tires. 3. Provide reports to the Central Technical Directorate (CTD). 4. Monitor the quality of technical (service) maintenance performed on locomotives. 5. Analyze data to improve the quality of locomotive acceptance/placement for unscheduled types of repairs and maintenance.

Position	Job Functions	Professional Skills/Competencies
7. Senior Locomotive Inspector (Locomotive Depot) / Locomotive Inspector (Locomotive Depot)	1. Monitoring production and labor discipline of locomotive inspectors. 2. Participation in autumn and spring commission inspections. 3. Quality control of repair work and technical maintenance of locomotives. 4. Acceptance of locomotives, multiple unit rolling stock, cars, assemblies, and equipment after repair and maintenance. 5. Inspector oversight of organizations performing repairs on locomotives and multiple unit rolling stock. 6. Analysis of work performance results.	1. Select tools and methods for monitoring the performance of locomotive (multiple unit rolling stock) repair and maintenance work. 2. Verify compliance with the timelines for placing locomotives (multiple unit rolling stock) into repair and maintenance, as established by relevant regulatory and internal acts, and take corrective actions if necessary. 3. Check parameters during repair and maintenance of locomotives (multiple unit rolling stock), components, and equipment in order to take appropriate measures. 4. Monitor the execution of repair and maintenance work on locomotives (multiple unit rolling stock), components, and equipment. 5. Inspect the serviceability of locomotives (multiple unit rolling stock), components, and equipment after all types of repair and maintenance before allowing access to the infrastructure, and take corrective actions if needed. 6. Collect data on the results of repair and maintenance work on locomotives (multiple unit rolling stock), as well as their acceptance (approval for infrastructure use), for subsequent analysis. 7. Analyze the causes of defects identified during the acceptance (approval for infrastructure use) of locomotives (multiple unit rolling stock), components, and equipment, in order to develop recommendations for their prevention and elimination (corrective actions).

2. Purpose and objectives of educational program

Purpose of EP:

Training of competent and competitive specialists who possess the theoretical and practical competencies necessary to carry out qualified work based on the latest technologies for the design, manufacture, use, maintenance, repair and operation of locomotives, who are aware of their responsibility for the results of their professional activities to society, the outside world and subsequent generations.

Educational Program Objectives

1. To develop the ability for self-improvement and professional growth of the individual, possessing a broad range of humanitarian and natural science knowledge and interests.

2. To form practical skills and competencies for implementing engineering solutions that contribute to the achievement of the Sustainable Development Goals (SDGs).

3. To foster readiness to motivate others toward the transition to more sustainable and stable forms of transport infrastructure.

4. To develop readiness for lifelong learning and the ability to apply acquired knowledge in everyday life in support of sustainable development.

5. To cultivate the ability to assess the impact of transport systems and technological processes on human health and the environment due to harmful emissions and acoustic pollution.

6. To instill the ability to act in the interests of people affected by climate change.

7. To develop the ability to critically reassess accumulated experience, change one's professional profile when necessary, recognize the social importance of one's future profession in the context of achieving the SDGs, and maintain strong motivation for professional activity.

8. To support the development of graduate readiness for the efficient and safe use of natural resources, energy, and materials in the operation, repair, and maintenance of locomotives.

9. To form the ability to understand the interconnections and interdependencies between actors and stakeholders, as well as the impact of various business aspects on the external environment.

10. To build understanding of how to improve the sustainability performance of an organization and adapt its structure and business model to achieve long-term outcomes, stakeholder balance, and the well-being of both business and society.

11. To develop the ability to balance various requirements (cost, quality, safety, and timeframes) in long- and short-term planning and to make optimal decisions in locomotive operation, repair, and maintenance; to cultivate a culture of critical thinking.

12. To foster the ability to generalize, analyze, and interpret information, set goals, and choose effective ways to achieve them.

13. To support graduate readiness to:

- develop design documentation for creating and modernizing locomotives;
- carry out engineering and calculation tasks related to locomotive modernization;
- prepare technical documentation, guidelines, proposals, and plans for the creation and modernization of locomotives.

14. To develop readiness for conducting technical and economic analysis, comprehensively justifying decisions in the field of operation, repair, and maintenance of locomotives, their units, systems, and components; to apply results in practice and to strive for continuous self-development, skills improvement, and professional mastery.

3. Requirements for evaluating the educational program learning outcomes

Educational Program 6B07124 – «Technology of production, repair and operation of locomotives» ensures all students achieve the planned learning outcomes required for professional practice.

The main principles of learning outcomes assessment are:

- Objectivity, reliability, and transparency in the presentation of information;
- Focus on the improvement of teaching and the learning process;
- Alignment of assessment tools with the learning outcomes defined by the State and subject-specific standards;
- Objectivity, reliability, and transparency in the presentation of information (reiterated);
- Compliance of norms, requirements, and indicators of students' academic achievements with their abilities, interests, social demands, and personality development needs;
- Systematic analysis of interim and final results of students' educational achievements;
- Adherence to key ethical standards in the assessment process.

Three types of assessment are used to measure learning outcomes: diagnostic, formative, and summative.

Diagnostic assessment is used to evaluate the learner's progress. During the academic semester, the instructor compares the initial level of competence development with the results achieved. The outcomes of diagnostic assessment serve as a basis for making adjustments and improving the learning process by setting educational objectives for the instructor and learning tasks for the student.

Formative assessment is applied to determine the learner's progress, taking into account individual characteristics of mastering the material (such as pace of work, learning methods, etc.), as well as to provide recommendations for achieving success. The instructor uses formative assessment to make timely adjustments to the teaching process and planning, while the student uses it to improve the quality of their work.

Student progress is defined as the achievement of specific results established in the learning objectives within educational areas and is evaluated based on the student's completed work. The instructor records observations of individual student progress in the electronic gradebook.

Summative assessment is used to determine the extent to which the learner has achieved the planned outcomes for each stage of education and includes current, midterm, and final assessment.

Current assessment of individually completed tasks is carried out according to assessment norms (number of correct answers, number of errors, adherence to formatting rules, etc.) and task-specific criteria set by the instructor and/or the students themselves. The instructor takes into account the individual learning characteristics of the student when conducting current assessments.

Midterm assessment is based on types of work specified in the course syllabus, such as written assignments/source analysis, oral responses/presentations, projects,

research papers, specific assignments, portfolios (achievement folders), etc. All types of work are assessed based on predefined criteria, are mandatory, and are scheduled by the instructor in advance when developing the assessment plan.

Final assessment is conducted in accordance with the academic calendar and is performed in written form in accordance with current standards and the developed grading criteria.

4. Passport of educational program

4.1. General information

№	Field name	Comments
1	Code and classification of the field of education	6B07 – Engineering, manufacturing and construction industries
2	Code and classification of training directions	6B071 – Engineering and Engineering affairs
3	Educational program group	B065 – Transport equipment and technology
4	Educational program name	6B07124 – «Technology of production, repair and operation of locomotive»
5	Short description of educational program	The educational program 6B07124 – «Technology of production, repair and operation of locomotive» is aimed at training highly qualified specialists in the fields of production, operation, and technical maintenance of locomotives and multiple unit rolling stock. The program is developed based on the Sectoral Qualifications Framework in the field of “Railway Transport” in accordance with the following Professional Standards: – Operation of locomotives and multiple unit rolling stock; – Management and control of traffic safety in railway transport. The program has been updated to ensure academic support for SDGs 4, 9, 12, and 13.
6	Purpose of EP	Training of competent and competitive specialists who possess the theoretical and practical competencies necessary to carry out qualified work based on the latest technologies for the design, manufacture, use, maintenance, repair and operation of locomotives, who are aware of their responsibility for the results of their professional activities to society, the outside world and subsequent generations
7	Type of EP	New EP
8	The level based on NQF	6
9	The level based on IQF	6
10	Distinctive features of EP	Double diploma EP
11	List of competencies of educational program	Professional Competencies (PC) PC1 – Master core concepts in mathematics, physics, and engineering graphics; possess foundational knowledge for professional disciplines. PC2 – Apply broad theoretical/practical knowledge to engineering practice, utilizing best industry standards to reduce transport’s environmental and social impact. PC3 – Implement engineering solutions compliant with: — National regulations — Technical standards — Environmental norms

№	Field name	Comments
		PC4 – Formulate, analyze, and solve complex engineering problems using theoretical/practical methods. PC5 – Apply cutting-edge engineering innovations to sustainable transport challenges. PC6 – Assess societal/cultural/ecological consequences of engineering decisions within SDG frameworks. PC7 – Resolve methodological/research challenges and make data-informed engineering decisions under constraints. PC8 – Manage engineering operations ensuring: — Quality/safety compliance — Operational reliability — Data-driven decision-making PC9 – Assume accountability for eco-conscious engineering solutions. PC10 – Conduct technical diagnostics to evaluate: — Locomotive condition — Repair quality PC11 – Integrate SDG principles into strategic/operational decisions. PC12 – Develop/modernize locomotives through: — Design documentation — Engineering calculations — Technical proposals PC13 – Perform techno-economic analyses to justify decisions in locomotive: — Operations — Maintenance — Servicing PC14 – Implement digital innovations to overcome SDG barriers. PC15 – Utilize domestic/foreign CAD systems for transport infrastructure design. PC16 – Apply metrological standards for quality/safety assurance. PC17 – Pursue interdisciplinary professional growth. PC18 – Adapt career paths to societal needs while maintaining SDG alignment. PC19 – Optimize organizational sustainability via business model adaptation. PC20 – Synthesize information and set strategic goals for sustainable transport.
12	Learning outcomes of educational program	LO 1 – Apply social and ethical norms taking into account spiritual processes in today's society, interpersonal and legal interests of the parties in the implementation of professional activities and communication, including in foreign languages. LO 2 – Solve engineering problems of durability, reliability and stability of machines, structures and structural elements based on the laws of mechanics.

№	Field name	Comments
		LO 3 – To construct technological process of maintenance, repair and diagnostics of locomotive parts and assemblies using means of mechanization, diagnostics and automation LO 4 – To develop a set of measures to ensure the safety of life, environmental protection and labor protection based on the analysis of harmful and dangerous factors in locomotive factories and other locomotives enterprises LO 5 – To apply the achievements of modern computer technology, software in all areas of the transport industry. LO 6 – To assess the technical condition and parameters of rolling stock components in order to optimize their designs and consumption rates of fuel and energy resources (fuel and energy complex), technical characteristics, safety improvements, environmental and technical and economic indicators. LO 7 – To analyze the criteria for the use of locomotives to ensure the safe operation of locomotives and fuel efficiency when interacting with railway transport infrastructure facilities to improve the sustainability of transport. LO 8 – To adapt the information of natural science disciplines for describing the processes and construction, development and improvement of models, systems and objects of transport equipment. LO 9 – To make technical, organizational, economic, and managerial decisions based on the Sustainable Development Goals. LO 10 – To analyze practical application of electrical and electronic equipment of the rolling stock based on the analysis of perspective and innovative technologies. LO 11 – To evaluate the reliability indicators of rolling stock parts and assemblies using modern diagnostic methods and tools based on regulatory and technical documents, technical and environmental standards. LO 12 – To implement innovative technologies to minimize environmental impacts and energy efficient consumption. LO 13– To assess the impact of transport systems and technological processes on human health and the environment due to the release of harmful emissions and acoustic emissions.
13	Education form	Full-time
14	Period of training	4 year
15	Amount of credits	240
16	Languages of instruction	English, Russian, Kazakh
17	Academic degree awarded	Bachelor of Engineering and Technology in the educational program 6B07124 – «Technology of production, repair and operation of locomotive»
18	Developer(s) and authors	Kamzanov N.S., Tokmurizna–Kobernyak N.A. employer: Beketov T.S. student: Tokarev M.Yu.

4.2. Relationship between the achievability of the formed learning outcomes based on educational program and academic disciplines

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
Cycle of general education disciplines																
Required component																
1	Foreign language	English is a compulsory subject. According to the results of placement test or IELTS score, students are placed into groups and disciplines. The name of the discipline corresponds to the level of English. When passing from level to level, prerequisites and postrequisites are respected.	10	v												
2	Kazakh (Russian) language	Kazakh (Russian) language In this course author considers socio-political, socio-cultural spheres of communication and functional styles of the modern kazakh (russian) language. The course covers the specifics of the scientific style to develop and activate professional communication skills and abilities of students. Also it allows students to leavn the	10	v												

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		basics of scientific style practically and develop the ability of production structural and semantic text analysis.														
3	Physical Culture	The purpose of the discipline is to master the forms and methods of forming a healthy lifestyle within the framework of the professional education system. Familiarization with the natural-scientific basics of physical education, knowledge of modern health-improving technologies, basic methods of independent physical education and sports. As part of the course, the student will master the rules of judging in all sports.	8	v												
4	Information and communication technologies	The aim of the course is to gain theoretical knowledge in information processing, the latest information technologies, local and global networks, the methods of information protection; Getting the	5					v								

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		right use of text editor editors and tabulators; creation of base and different categories of applications.														
5	The history of Kazakhstan	The purpose of the discipline is to provide objective historical knowledge about the main stages of the history of Kazakhstan from ancient times to the present day; introduce students to the problems of the formation and development of statehood and historical and cultural processes; contribute to the formation of humanistic values and patriotic feelings in the student; teach the student to use the acquired historical knowledge in educational, professional and everyday life; evaluate the role of Kazakhstan in world history.	5	v												
6	Philosophy	The purpose of the discipline is to teach students the theoretical foundations of philosophy	5	v												

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		as a way of knowing and spiritually mastering the world; developing their interest in fundamental knowledge, stimulating the need for philosophical assessments of historical events and facts of reality, assimilating the idea of the unity of the world historical and cultural process while recognizing the diversity of their skills in applying philosophical and general scientific methods in professional activities.														
7	Module of Socio-Political Knowledge (Sociology and Politology)	The objectives of the disciplines are to provide students with explanations on the sociological analysis of society, about social communities and personality, factors and patterns of social development, forms of interaction, types and directions of social processes, forms of regulation of social behavior, as well as	3	v												

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		primary political knowledge that will serve as a theoretical basis for understanding social - political processes, for the formation of political culture, development of a personal position and a clearer understanding of the extent of one's responsibility; help to master the political, legal, moral, ethical and socio-cultural norms necessary to act in the interests of society, form personal responsibility and achieve personal success.														
8	Module of Socio-Political Knowledge (Culturology and Psychology)	The purpose of the disciplines is to study the real processes of cultural creative activity of people who create material and spiritual values, identify the main trends and patterns of cultural development, changes in cultural eras, methods and styles, their role in the formation of man and the development of society, as	5	v												

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		well as master psychological knowledge for the effective organization of interpersonal interaction, social adaptation in the field of their professional activities.														
Cycle of general education disciplines																
Component of choice																
9	Fundamentals of scientific research methods	Purpose: The goal of studying the discipline is to develop students' research skills; to introduce students to scientific knowledge, their readiness and ability to conduct research. Objectives of studying the discipline: to contribute to the deepening and consolidation of existing theoretical knowledge by students; to develop practical skills in conducting scientific research, analyzing the results obtained and developing recommendations; to improve methodological skills in independent work	5					v			v					

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		with information sources and appropriate software and hardware.														
10	Fundamentals of anti-corruption culture and law	Purpose: to increase the public and individual legal awareness and legal culture of students, as well as the formation of a knowledge system and a civic position on combating corruption as an antisocial phenomenon. Contents: improvement of socio-economic relations of the Kazakh society, psychological features of corrupt behavior, formation of an anti-corruption culture, legal responsibility for acts of corruption in various fields.	5	v												
11	Fundamentals of economics and entrepreneurship	Purpose: To develop basic knowledge of economic processes and skills in entrepreneurial activities. Content: The course aims to develop skills in analyzing economic concepts such as supply and demand, and market equilibrium. It includes the basics of creating and	5	v								v				

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		managing a business, developing business plans, risk assessment, and strategic decision-making.														
12	Ecology and life safety	Purpose: formation of ecological knowledge and consciousness, obtaining theoretical and practical knowledge on modern methods of rational use of natural resources and environmental protection. Contents: the study of the tasks of ecology as a science, the laws of the functioning of natural systems and aspects of environmental safety in working conditions, environmental monitoring and management in the field of its safety, ways to solve environmental problems; life safety in the technosphere, emergencies of a natural and man-made nature.	5				v									v
13	Basics of Financial Literacy	Purpose: formation of financial literacy of students on the basis of building a direct link	5	v								v				

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		between the acquired knowledge and their practical application. Contents: using in practice all kinds of tools in the field of financial management, saving and increasing savings, competent budget planning, obtaining practical skills in calculating, paying taxes and correctly filling out tax reports, analyzing financial information, orienting in financial products to choose adequate investment strategies.														
Cycle of basic disciplines University component																
14	Mathematics I	Purpose: to introduce students to the fundamental concepts of linear algebra, analytical geometry and mathematical analysis. To form the ability to solve typical and applied problems of the discipline. Contents_ Elements of linear algebra, vector algebra and analytical geometry. Introduction to	5								v					

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		the analysis. Differential calculus of a function of one variable. The study of functions using derivatives. Functions of several variables. Partial derivatives. The extremum of a function of two variables.														
15	Physics	Purpose: To form ideas about the modern physical picture of the world and scientific worldview, the ability to use knowledge of fundamental laws, theories of classical and modern physics. Contents physical fundamentals of mechanics, fundamentals of molecular physics and thermodynamics, electricity and magnetism, vibrations and waves, optics and fundamentals of quantum physics.	5								v					
16	Mathematics II	Purpose: To teach students integration methods. To teach you how to choose the right method for finding the primitive. To teach how to apply a	5								v					

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		certain integral to solve practical problems. Contents integral calculus of the function of one and two variables, series theory. Indefinite integrals, methods of their calculation. Certain integrals and applications of certain integrals. Improper integrals. Theory of numerical and functional series, Taylor and Maclaurin series, application of series to approximate calculations														
17	Engineering and computer graphics	Purpose: To develop students' knowledge of drawing construction and skills in developing graphical and textual design documentation in accordance with standards. Content: Students will study ESKD standards, graphic primitives, geometric constructions, methods and properties of orthogonal projection, Monge's projection, axonometric projections,	5		v			v								

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		metric tasks, types and features of connections, creating part sketches and assembly drawings, detailing, and creating complex 3D solid objects in AutoCAD.														
18	Theoretical and applied mechanics	To involve students in the development and solution of tasks that help bridge the gap between scientific theory and engineering practice. Contents_ Theoretical mechanics, theory of mechanisms and machines. Theoretical mechanics deals with the general laws of mechanical movements of material bodies and the mechanical interactions between them. In the theory of mechanisms and machines, general methods of research, construction, and kinematics of mechanisms and machines are studied	5		v											
19	Strength of materials	to independently calculate structural elements, mechanisms and machine parts. Contents_ Stretching	5		v											

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		and compression. Stresses in cross sections and deformations of a straight rod. Mechanical properties of materials under tension and compression. Calculation of tensile and compressive strength and stiffness. Geometric characteristics of flat sections. Shear and torsion. Calculation of strength and torsional stiffness. The bend. Normal and tangential bending stresses														
20	The theory of machines and mechanisms	The main types of flat and spatial mechanisms. Structural synthesis and analysis of mechanisms. Kinematic analysis of mechanisms by graphical and analytical methods. Force analysis of mechanisms. Differential equations of motion of mechanisms and machines and methods of their solution. Balancing the mechanisms. Contents General methods of synthesis (design) of	5		v											

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		mechanisms. Synthesis of plane and spatial lever mechanisms. Synthesis of gear mechanisms. Synthesis of cam mechanisms. Synthesis of manipulators and robots														
21	Bases of designing and details of cars	Purpose: to acquire knowledge of calculations and design of machine parts and assemblies, taking into account the criteria of strength, reliability and stability. Contents general principles of design and construction, construction of models and calculation algorithms for standard machine parts taking into account performance criteria, fundamentals of theory and methodology for calculating standard machine parts, computer technologies for designing assemblies and machine parts. Basic requirements for machine parts and assemblies	5		v											

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
22	Electrical engineering and electronics fundamentals	Purpose: knowledge is being formed about the basics of the electromagnetic field, electric and magnetic circuits, DC, sinusoidal and non-sinusoidal current circuits, electric and magnetic fields, surface and affine influences, electromagnetic protection, electromagnetic devices and electric machines. Contents: transformer, DC machine, asynchronous and synchronous machines; fundamentals of electronics, element bases of modern electronic devices; fundamentals of digital electronics, microprocessor tools, electrical measuring and instrumentation	5										v			
23	Modern construction materials	The purpose of the discipline is to form knowledge about modern materials used in mechanical engineering, progressive technological methods of their	5		v											

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		application. The classification of engineering materials, the main properties of structural materials, methods of their heat treatment are considered. Properties and characteristics of metal alloys, ceramic and composite materials, powder and synthetic superhard materials, multifunctional coatings. Methods of studying the structure and composition of materials, diagram of iron-cementite. The skills of analyzing the composition and structure of materials, choosing the material for specific designs of machine parts are acquired.														
24	Fundamentals of railways (Introduction to the Specialty)	Objective: Obtaining primary knowledge about railway transport. Contents: History of the development of railway transport. Transport infrastructure and rolling stock.	4						v	v					v	

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		Indicators of railway transport. Technical regulations and safety requirements. The impact of rail transport on the environment and the economic development of the country.														
25	Rolling stock and railway transport infrastructure	The purpose of the discipline is aimed at the formation of professional competencies in the design of the operational fleet of rolling stock and technical requirements for railway infrastructure. Contents: general information about transport; track and track facilities; railway power supply; design features, technical characteristics of locomotives and wagons; locomotive, carriage facilities; rules of technical operation; organization of transportation and train movement.	6						v	v					v	v
26	Standardization and certification of rolling stock	Purpose: to study the basic concepts and definitions of standardization and certification of rolling	5									v		v		

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		stock, tolerances and landings, documentation of quality systems, the main provisions of the national system of standardization and certification of rolling stock. Content: Regulatory and legal regulation of the standardization and certification system. Standardization methods. Tolerances and landings. Quality management systems. Terms and definitions in the field of certification. Certification in railway transport.														
27	Hydraulics and hydraulic drive of vehicles	Purpose: to acquire knowledge and skills in the field of hydraulics and hydraulic drives of vehicles for practical use in solving specific tasks to improve transport equipment facilities. Contents: hydrostatics, hydrodynamics, hydraulic drive, hydraulic machines. The basic concepts and fundamental laws of hydrostatics and	5		v											

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		hydrodynamics are studied. Calculation of pipelines. Hydraulic machines and hydraulic drive of vehicles.														
28	Dynamics of traction rolling stock	Goal: acquiring the skills to assess the dynamic characteristics of a locomotive and establish safe operating modes using modern software. Contents: dynamic system «locomotive-track»; types of disturbances, methods of compiling and solving equations of crew oscillations; assessment of dynamic quality indicators of locomotives and establishment of safe operating modes; application of modern software in solving dynamics problems.	4						v	v						v
29	Industrial economics	Purpose: To provide students with an understanding of the basic principles and factors affecting industrial economics, including the organization of production, the competitiveness of	5									v				

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		enterprises, and the impact of government policy. Content: study the structure and dynamics of industrial production, analyze the main factors affecting the efficiency of enterprises, including technological innovation, factors of production and competition. Examination of the role of public policy in industrial development and industrial safety issues.														
30	Sustainable transport	Objective: to develop the ability to evaluate and apply in professional activities the norms and principles, goals and objectives of sustainable transport development Content: Definition of sustainable transport. The goals of sustainable transport development are to improve the quality of services and access to goods and services, reduce the number of transport-related accidents and crimes, improve air quality,	5				v		v	v		v			v	v

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		and reduce noise levels. Comprehensive internal transport system. Concepts of sustainable transport. «Green» technologies in transport														
31	Safety and labor protection in transport	Objective: formation of occupational safety skills in order to ensure safe working conditions for personnel in transport. Content: Main directions of state policy in the field of labor protection. Dangerous and harmful factors in transport and their regulation. Personal and collective protective equipment. Electrical safety. Fire safety. Occupational injuries. Transport Occupational Safety Management System	5				v								v	v
32	IT technologies on rolling stock	Purpose: to study the principles of development and creation of modern methods and means of obtaining, storing and processing information obtained during the	4					v								

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		assessment of the technical condition of traction rolling stock based on the use of new information technologies and diagnostic complexes. Content: The concept of information technology. Structure and classification of information technologies. Information technologies in railway transport. Information systems. Automated railway transport management system.														
Cycle of basic disciplines Component of choice																
33	ESG principles in inclusive culture	Purpose of the course: It focuses on studying ESG (Environmental, Social, Governance) principles and their interaction with the creation of an inclusive culture within an organization. Content: Students will gain knowledge on how implementing ESG principles contributes to corporate social	5	v												

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		responsibility, sustainable development, and equal opportunities for all employees, including those who may face various forms of discrimination. The course will help students understand the importance of an inclusive culture in achieving long-term business goals and ensuring sustainable organizational development.														
34	Electrical equipment of locomotives	Purpose: calculation of electrical equipment elements, selection of electrical circuits of control circuits and mastering methods of protection of electrical equipment of locomotives. Contents: general information, units of power systems of locomotives with DC traction drive, AC rectifier systems, emergency modes and protection systems for power equipment, main circuits of the locomotive control system, electric	5										v			

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		locomotives, microprocessor control and regulation system.														
35	Electric machines in land transport	Objective: to analyze technical solutions for improving performance and using methods for calculating parameters of electric machines of direct, alternating and three-phase currents. Contents: design, principle of operation, classification and characteristics of electric machines and transformers of general industrial use, voltages, currents and torques, methods of starting and regulating the frequency of electric motors, physical working conditions, losses and efficiency.	5										v			
36	Fundamentals of railway rolling stock design	Objective: to acquire competencies in the field of fundamentals of design and reconstruction of new railway lines in the field of organization and management of transportation. Contents:	5						v							

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		General issues of designing new and reconstruction of operated railways. Placement, selection of types and openings of culverts. A comprehensive selection of the main technical parameters of the projected new railway line, a rational strategy for step-by-step capacity building.														
37	Design of transport facilities	The purpose of the discipline is to master the methods of designing individual elements of railway stations and junctions, the main elements of highways, the principles of urban planning, the main elements of airfields and airports and other issues of the basics of designing communication routes and their content. Contents: Classification of separate railway points. The main elements of highways. Designing cities. Designing airfields and airports.	5						v						v	

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
38	Theory of automatic control in rolling stock	Purpose: to form students' ideas about the role of automation on railway rolling stock, automation levels, functional elements of automatic control systems in rolling stock. Contents: The main tasks of the theory of automatic control. Mathematical models of automatic control systems. Research methods for linear nonlinear automatic control systems. Stability of automatic control systems. Modern trends in the development of management systems.	5					v					v			
39	Automation of technological processes of ground transport	The purpose of the discipline is the formation of the ability to solve problems of automation of production processes using modern technical means. Contents: automated process control systems; information systems of automated process control systems; fundamentals of modeling technological	5			v										

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		objects, controlled automated process control systems; structure and algorithms of process control.														
40	Non-destructive testing of rolling stock	Purpose: to develop skills in working with diagnostic equipment for non-destructive testing; assessment and analysis of reliability indicators of parts and components of rolling stock using modern diagnostic methods and tools based on normative and technical documents and technical standards. Contents: classification of defects in parts, types and methods of non-destructive testing; types of non-destructive testing; device, principle of operation, configuration of equipment used for non-destructive testing of rolling stock parts.	6			v								v		
41	Rolling stock technical diagnostics systems	Goal: developing the ability to plan work on diagnostics, collection, processing and analysis of	6			v								v		

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		data from diagnostic systems of rolling stock. Contents: factors influencing wear processes of parts; methods for diagnosing technical systems; locomotive equipment diagnostic systems; methods for analyzing the technical efficiency of rolling stock and its equipment; mathematical basis for solving technical diagnostic problems.														
42	Theory and practice of project management	Purpose: To develop knowledge and skills in project management for effective project execution in various fields. Content: The course covers fundamental theories and methods of project management, including project planning, organization, control, and completion. Topics include risk management, resource management, communication, and quality management.	5									v				

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
43	Fundamentals of Artificial Intelligence	Purpose: to familiarize students with the basic concepts, methods and technologies in the field of artificial intelligence: machine learning, computer vision, natural language processing, etc. Contents: general definition of artificial intelligence, intelligent agents, information retrieval and state space exploration, logical agents, architecture of artificial intelligence systems, expert systems, observational learning, statistical learning methods, probabilistic processing of linguistic information, semantic models, natural language processing systems.	5					v								
44	Legal regulation of intellectual property	Purpose: the goal is to form a holistic understanding of the system of legal regulation of intellectual property, including basic principles, mechanisms for protecting intellectual property rights and features	5	v												

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		of their implementation. Content: The discipline covers the basics of IP law, including copyright, patents, trademarks, and industrial designs. Students learn how to protect and manage intellectual property rights, and consider legal disputes and methods for resolving them.														
Cycle of profile disciplines University component																
45	Design and construction of locomotives	Goal: acquiring the skills to evaluate the parameters and design of a locomotive based on technical standards. Contents: design, calculation and selection of optimal design options and technical parameters of modern locomotives; assessment of the influence of operating conditions of locomotive structural elements on its safety and reliability (mechanical parts, electrical equipment and electrical devices, diesel	5						v	v						

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		and electric motors, auxiliary systems and equipment).														
46	Reliability of rolling stock	Contents: reliability of rolling stock, reliability indicators and methods for their calculation; reliability standards; types of rolling stock failures, factors affecting the reliability of rolling stock; ways to improve the reliability of rolling stock; reliability management.	4											v		
47	Locomotive repair and maintenance technology	Goal: development of skills in developing technology for repair and maintenance of locomotives using modern methods and diagnostic tools. Contents: types of locomotive faults; locomotive repair technology; repair organization system and regulatory and technical documentation; methods for improving the system of repair and diagnostics of locomotives.	6			v										v

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
48	Management of reliability and safety in railway transport	Goal: acquiring skills in managing reliability and safety in railway transport. Contents: methods and regulatory and technical framework for managing the functional safety and reliability of railway infrastructure facilities, the procedure for developing plans/programs to ensure the safety and reliability of railway transport, information systems for managing functional safety and reliability.	4							v				v		
Cycle of profile disciplines Component of choice																
49	Theory of locomotive traction	Goal: mastering the skills of efficient operation of locomotives based on the use of energy-saving train driving modes. Contents: theoretical foundations of the processes of formation of traction and braking forces, methods for calculating movement resistance, the basic equation of train motion and methods for solving it,	5						v	v					v	v

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		traction calculations, methods for rationing energy consumption for train traction, rational train driving modes.														
50	Automation and automation of locomotives	Purpose: to study the fundamentals of the theory of linear automatic systems, methods and tools used in the creation of automatic systems. Contents: Principles of building automatic systems. Classification of locomotive automatic control, regulation and protection systems. Algorithms for the operation of automatic regulators. Circuits of automatic systems: basic, functional, structural. Static and dynamic characteristics and parameters of automatic systems and their elements. Typical dynamic links of automatic systems. Typical connections of dynamic links.	5										v			
51	Organization of locomotive operation	Goal: acquiring skills in organizing the operation of	6							v				v		

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
	and locomotive management	locomotives on the basis of regulatory and technical documents. Contents: Rules for technical operation in railway transport; organization and calculation of locomotive performance indicators, organization of work of locomotive crews, locomotive facilities (main and turnover depots, maintenance and equipment points); ways to improve the efficiency of locomotives; on-board locomotive diagnostic systems and operational reliability.														
52	Electrical apparatus and electrical diagrams of locomotives	Purpose: to study the electrical circuits of locomotives, types of electrical equipment of locomotives, the basics of the theory of operation of contact electrical devices. Contents: General information about electric locomotives, locomotive relays, electromagnetic and electropneumatic	5										v			

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		contactors, information about semiconductor and magnetic elements. Traction electric machines. Switching devices of locomotives. Control, automation, control and protection devices. Magnetic and semiconductor devices of locomotives.														
53	Electric power transmission of locomotives	Purpose: To study the types of electric power transmissions of locomotives, the principles of their construction, operation and calculation, devices and characteristics of electric transmission elements of locomotives. Contents: Types and parameters of locomotive power transmissions. The joint operation of diesel and electric transmission. Characteristics and operating modes of traction electric motors of locomotives. Electrodynamic braking of locomotives. Designs,	5										v			

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		principle of operation, characteristics of traction generators of diesel locomotives.														
54	Power plants of locomotives	Purpose: Comprehensive study of locomotive power plants by students, in-depth study of characteristics, properties, features of working conditions and technical requirements of locomotive power plants. Contents: Theoretical foundations of the operation of a locomotive power plant. Working processes and design of diesel locomotives. Dynamics and automation of diesel engines. Tests of diesel locomotives. Locomotive gas turbine installations. Improvement of the design and technical characteristics of locomotive power plants.	5						v	v					v	v
55	Locomotive control systems and circuits	Purpose: to study the automatic control systems of autonomous locomotives and the features of their operation; the ability to	5						v				v			

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		calculate the elements and components of the electrical equipment of autonomous locomotives. Contents: The main devices of traction devices and electrical equipment of locomotives are considered, description of electromagnetic processes in power circuits and control circuits of a locomotive, analysis and calculation of the main parameters of electrical devices, calculation and design of electrical circuits, comparative analysis of control systems of locomotives of various series.														
56	Automatic braking of traction rolling stock	Purpose: to study the basic principles of operation, rules of operation and maintenance of motor brakes of rolling stock. Contents: Basic information about car brakes. Purpose, device and principle of operation of rolling stock braking	5						v	v						

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		equipment. Classification of brakes. Diagrams of the braking equipment of wagons and locomotives. Devices for supplying brakes with compressed air. Brake control devices. Brake lever gears of locomotives and wagons. Checking the technical condition of the braking equipment of locomotives.														
57	Automatic control of electric transmission of locomotives	Purpose: to study by students the basic methods of controlling electric power transmissions of locomotives, the principles of their automation and construction, operation and calculation; to study the device and characteristics of the elements of electric transmissions of locomotives Contents: the automation of the normal mode is considered; automatic control of the rotation frequency and active power of synchronous Generators; purpose and features of	5										v			

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		automatic frequency and power control; static frequency characteristics of the power system; methods of automatic regulation, types of regulators.														
58	Technology of design and calculation of locomotive design	Purpose: to study methods of design analysis, calculation of structures and components of locomotives. Contents: The main types of traction rolling stock and its classification are considered; the history and trend of development of locomotive construction in the Republic of Kazakhstan; the stages of design and calculation of locomotives; the choice of traction equipment and calculation of traction and economic characteristics; the basic principles of layout and distribution of the locomotive.	5						v							
59	Technological design of locomotive enterprises	Purpose: To study the methodology of technological design of production sites	5			v									v	

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)												
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13
		(departments) of a locomotive depot. Contents: The classification of enterprises for the repair and operation of locomotives is considered; regulatory documents for the design of buildings and structures of the locomotive industry; the choice of the main sizes of sections of the depot stall and the lifting capacity of cranes; calculation of the number of stalls for locomotives; design and calculation of the parameters of sections and departments of the depot.														

WORKING CURRICULUM

Academic year	2025-2026 (Autumn, Spring)
Group of educational programs	B065 - "Transport equipment and technology"
Educational program	6B07124 - "Technology of production, repair and operation of locomotives"
The awarded academic degree	Bachelor of engineering and technology
Form and duration of study	full time - 4 years

Discipline code	Name of disciplines	Block	Cycle	Total ECTS credits	Total hours	lek/lab/pr Contact hours	in hours SIS (including TSIS)	Form of control	Allocation of face-to-face training based on courses and semesters								Prerequisites	
									1 course		2 course		3 course		4 course			
									1 sem	2 sem	3 sem	4 sem	5 sem	6 sem	7 sem	8 sem		
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)																		
M-1. Module of language training																		
LNG108	Foreign language		GED, RC	5	150	0/0/45	105	E	5									
LNG104	Kazakh (russian) language		GED, RC	5	150	0/0/45	105	E	5									
LNG108	Foreign language		GED, RC	5	150	0/0/45	105	E		5								
LNG104	Kazakh (russian) language		GED, RC	5	150	0/0/45	105	E		5								
M-2. Module of physical training																		
KFK101	Physical culture I		GED, RC	2	60	0/0/30	30	E	2									
KFK102	Physical culture II		GED, RC	2	60	0/0/30	30	E		2								
KFK103	Physical culture III		GED, RC	2	60	0/0/30	30	E			2							
KFK104	Physical culture IV		GED, RC	2	60	0/0/30	30	E				2						
M-3. Module of information technology																		
CSE677	Information and communication technology		GED, RC	5	150	30/15/0	105	E			5							
M-4. Module of socio-cultural development																		
HUM137	History of Kazakhstan		GED, RC	5	150	15/0/30	105	GE		5								
HUM134	Module of socio-political knowledge (cultural studies, psychology)		GED, RC	5	150	30/0/15	105	E			5							
HUM132	Philosophy		GED, RC	5	150	15/0/30	105	E				5						
HUM120	Module of socio-political knowledge (sociology, political science)		GED, RC	3	90	15/0/15	60	E				3						
M-5. Module of anti-corruption culture, ecology and life safety base																		
CHE656	Ecology and life safety	1	GED, CCH	5	150	30/0/15	105	E				5						
MNG489	Fundamentals of economics and entrepreneurship	1	GED, CCH	5	150	30/0/15	105	E				5						
PET519	Fundamentals of scientific research methods	1	GED, CCH	5	150	30/0/15	105	E				5						
HUM136	Fundamentals of anti-corruption culture and law	1	GED, CCH	5	150	30/0/15	105	E				5						
MNG564	Basics of Financial Literacy	1	GED, CCH	5	150	30/0/15	105	E				5						
CYCLE OF BASIC DISCIPLINES (BD)																		
M-5. Module of anti-corruption culture, ecology and life safety base																		
CHE950	ESG principles in inclusive culture	1	BD, CCH	5	150	30/0/15	105	E				5						

M-6. Module of physical and mathematical training																		
MAT101	Mathematics I		BD, UC	5	150	15/0/30	105	E	5									
PHY468	Physics		BD, UC	5	150	15/15/15	105	E	5									
MAT102	Mathematics II		BD, UC	5	150	15/0/30	105	E		5								MAT101
M-7. Basic Engineering Training Module																		
GEN429	Engineering and computer graphics		BD, UC	5	150	15/0/30	105	E	5									
MCH505	Modern construction materials		BD, UC	5	150	15/30/0	105	E		5								
GEN411	Theoretical and applied mechanics		BD, UC	5	150	30/15/0	105	E			5							
GEN408	Strength of materials		BD, UC	5	150	15/15/15	105	E			5							
GEN127	The theory of machines and mechanisms		BD, UC	5	150	30/15/0	105	E				5						GEN114, GEN115
GEN125	Bases of designing and details of cars		BD, UC	5	150	15/15/15	105	E					5					
TRA430	Electrical engineering and electronics fundamentals		BD, UC	5	150	15/15/15	105	E					5					PHY1111
M-8. Basic training module																		
TRA644	Fundamentals of railways (Introduction to the Specialty)		BD, UC	4	120	30/0/15	75	E	4									
AAP173	Practical training		BD, UC	2				R		2								
TRA625	Standardization and certification of rolling stock		BD, UC	5	150	30/0/15	105	E			5							
TRA580	Rolling stock and railway transport infrastructure		BD, UC	6	180	30/0/30	120	E				6						
TRA582	Hydraulics and hydraulic drive of vehicles		BD, UC	5	150	30/0/15	105	E					5					
TRA623	Dynamics of traction rolling stock		BD, UC	4	120	30/0/15	75	E					4					
TRA585	Electrical equipment of locomotives	1	BD, CCH	5	150	30/0/15	105	E					5					
TRA613	Electric machines in land transport	1	BD, CCH	5	150	30/0/15	105	E					5					
TRA630	Fundamentals of railway rolling stock design	2	BD, CCH	5	150	30/0/15	105	E					5					
TRA631	Design of transport facilities	2	BD, CCH	5	150	30/15/0	105	E					5					
TRA584	Theory of automatic control in rolling stock	1	BD, CCH	5	150	30/0/15	105	E						5				
TRA622	Automation of technological processes of ground transport	1	BD, CCH	5	150	30/0/15	105	E						5				
TRA586	Non-destructive testing of rolling stock	1	BD, CCH	6	180	30/15/15	120	E							6			
TRA587	Rolling stock technical diagnostics systems	1	BD, CCH	6	180	30/15/15	120	E							6			
M-9. Fundamentals of Economics, Sustainable Development and IT Technologies Module																		
NSE143	Industrial economics		BD, UC	5	150	30/0/15	105	E				5						
TRA642	Sustainable transport		BD, UC	5	150	30/0/15	105	E						5				
TRA626	IT technologies on rolling stock		BD, UC	4	120	30/0/15	75	E						4				
CSE831	Fundamentals of Artificial Intelligence	1	BD, CCH	5	150	15/0/30	105	E						5				
MNG562	Legal regulation of intellectual property	1	BD, CCH	5	150	30/0/15	105	E						5				
MNG533	Theory and practice of project management	1	BD, CCH	5	150	30/0/15	105	E						5				
TRA643	Safety and labor protection in transport		BD, UC	5	150	30/15/0	105	E							5			
CYCLE OF PROFILE DISCIPLINES (PD)																		
M-10. Module of professional activity																		
AAP102	Production practice I		PD, UC	2				R				2						
TRA598	Reliability of rolling stock		PD, UC	4	120	30/0/15	75	E						4				
AAP183	Production practice II		PD, UC	3				R						3				
TRA605	Theory of locomotive traction	1	PD, CCH	5	150	30/0/15	105	E						5				
TRA593	Automation and automation of locomotives	1	PD, CCH	5	150	30/0/15	105	E						5				
TRA590	Design and construction of locomotives		PD, UC	5	150	30/0/15	105	E							5			
TRA616	Locomotive repair and maintenance technology		PD, UC	6	180	30/0/30	120	E							6			
TRA600	Organization of locomotive operation and locomotive management	1	PD, CCH	6	180	30/0/30	120	E							6			
TRA618	Electrical apparatus and electrical diagrams of locomotives	2	PD, CCH	5	150	30/0/15	105	E							5			
TRA619	Electric power transmission of locomotives	2	PD, CCH	5	150	30/0/15	105	E							5			

TIL123	Management of reliability and safety in railway transport		PD, UC	4	120	30/0/15	75	E									4	
TRA615	Power plants of locomotives	1	PD, CCH	5	150	30/15/0	105	E									5	
TRA603	Locomotive control systems and circuits	1	PD, CCH	5	150	30/0/15	105	E									5	
TRA595	Automatic braking of traction rolling stock	2	PD, CCH	5	150	30/0/15	105	E									5	
TRA594	Automatic control of electric transmission of locomotives	2	PD, CCH	5	150	30/0/15	105	E									5	
TRA620	Technology of design and calculation of locomotive design	3	PD, CCH	5	150	30/0/15	105	E									5	
TRA621	Technological design of locomotive enterprises	3	PD, CCH	5	150	30/0/15	105	E									5	
M-11. Module of final attestation																		
ECA103	Final examination		FA	8													8	
Additional type of training (ATT)																		
AAP500	Military training																	
Total based on UNIVERSITY:									31	29	27	33	29	31	33	27		
									60		60		60		60			

Number of credits for the entire period of study					
Cycle code	Cycles of disciplines	Credits			
		Required component (RC)	University component (UC)	Component of choice (CCH)	Total
GED	Cycle of general education disciplines	51	0	5	56
BD	Cycle of basic disciplines	0	95	26	121
PD	Cycle of profile disciplines	0	24	31	55
Total for theoretical training:		51	119	62	232
FA	Final attestation				8
TOTAL:					240

Decision of the Educational and Methodological Council of KazNRTU named after K.Satpayev. Minutes № 3 dated 20.12.2024

Decision of the Academic Council of the Institute. Minutes № 3 dated 29.11.2024

Signed:					
Governing Board member - Vice-Rector for Academic Affairs		Uskenbayeva R. K.			
Approved:					
Vice Provost on academic development		Kalpeyeva Z. B.			
Head of Department - Department of Educational Program Management and Academic-Methodological Work		Zhumagaliyeva A. S.			
Supervisor - School of Transport Engineering and Logistics		Abdullayev S. C.			
Department Chair - Transport Engineering		Kamzanov N. .			
Representative of the Academic Committee from Employers		Imentaeva S. G.			
____Acknowledged____					