School of transport engineering and logistics named after M. Tynyshpayev
«Transportation Engineering» Direction

EDUCATIONAL PROGRAM

7M07140 – «Railway transport»

Code and classification of the field of education:	7M07 – Engineering, manufacturing and construction industries
Code and classification of training directions:	7M071 – Engineering and Engineering affairs
Group of educational programs:	M104 – Transport, transport equipment and technologies
Level based on NQF:	7
Level based on IQF:	7
Study period:	2 year
Amount of credits:	120

Almaty 2025

Educational program 7M07140 – «Railway transport» 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 7M07140 – «Railway transport» was developed by Academic committee based on direction 7M071 – Engineering and Engineering affairs

Full name	Academic degree/ academic title	Position	Workplace	Signature
Chairperson of Academic Committee:				
Abdullaev S.S.	Doctor of Technical Sciences, Professor	Head of the School of Transport Engineering and Logistics	KazNRTU named after K.I. Satpayev	
Teaching staff:				
Kamzanov N.S.	Doctor of Philosophy (PhD)	Head of EP «TE»	KazNRTU named after K.I. Satpayev	
Akhmetova Sh.D.	Candidate of Technical Sciences	Associate Professor	KazNRTU named after K.I. Satpayev	
Tokmurzina-Kobernyak N.A.	Candidate of Technical Sciences	Associate Professor	KazNRTU named after K.I. Satpayev	
Employers:				
Beketov T.S.	Master of Technical Sciences	General manager	«Megadrive» LLP	
Students				
Kayratova A.Ye.	–	2-year Master's student	KazNRTU named after K.I. Satpayev	

Table of contents

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;
BTR – between-train repairs;
IQF – Industry Qualifications Framework.

1. Description of educational program

The educational program «7M07140 – Railway Transport», within the field of training 7M071 – Engineering and Engineering affairs, is aimed at preparing competent scientific and pedagogical experts capable of conducting research on relevant issues in the design, operation, maintenance, and repair of railway rolling stock. The training is based on modern theoretical, methodological, and technological achievements in science and engineering, with a strong awareness of professional responsibility to society, the environment, and future generations.

By implementing the concept of sustainable development, this educational program is designed in accordance with the four core principles of sustainable human development and incorporates the key Sustainable Development Goals (SDGs).

The following key goals can be identified:

«Industry, Innovation and Infrastructure» (SDG 9)

The program promotes the development of the following competencies among bachelor's degree students:

– the ability to motivate their environment to transition to more sustainable and stable forms of transport infrastructure;

– the ability to implement innovative technologies to minimize environmental impact and ensure energy-efficient consumption;

– the ability to assess the effects of transport systems and technological processes on human health and the environment due to harmful emissions and acoustic pollution.

«Responsible Consumption and Production» (SDG 12)

The program fosters the development of the following competencies among bachelor's degree students:

– the ability to make technical, organizational, economic, and managerial decisions based on the goals of sustainable development;

– the ability to promote the dissemination of sustainable production models.

«Climate Action» (SDG 13)

The program contributes to the development of the following competencies among bachelor's degree students:

– the ability to assess how climate-safe their daily and professional activities are and adjust them accordingly, if necessary;

– the ability to act in the interests of people threatened by climate change;

– the ability to forecast, calculate, and evaluate the long-term impact of decisions and measures taken by themselves, as well as at local and national levels, on other people and regions around the world.

The educational program has been 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 and Inspection of Locomotives After Repair;

– Quality Management;

– Pedagogue (Academic Teaching Staff) of Higher and/or Postgraduate Education Institutions.

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

Table 1 – Distribution of Railway Industry Personnel by Job Groups.

Group	Educational Qualification Requirements	Qualification Level According to the (SQF / OPK)
Top-level Executives	Higher or Postgraduate Education	7,8
Executives	Higher or Postgraduate Education	5,6,7
	Technical and Vocational Education and Training (TVET)	5
Specialists	Higher or Postgraduate Education	5,6
	TVET	4,5
Administrative Staff	Higher or Postgraduate Education	5
	TVET	4,5
	Secondary Education	3
Workers	TVET	4
	Secondary Education	2,3

Graduates of this educational program correspond to Level 7 of the National Qualifications Framework (NQF) and the Sectoral Qualifications Framework (SQF).

They are qualified to work as managers (with relevant work experience), specialists, and technical personnel in enterprises involved in the production, operation, and maintenance of locomotives and multiple-unit rolling stock.

Professional Field:

Railway Transport, Transport Engineering and Technologies.

The professional activity objects of the graduate include:

– Departments of industrial enterprises involved in the production, operation, maintenance, and repair of locomotives and multiple-unit rolling stock;

– Departments of government institutions responsible for the operation, repair, and maintenance of locomotives and multiple-unit rolling stock;

– Departments of design organizations engaged in the development, manufacturing, and technical support of innovative rolling stock;

– Research institutions conducting studies in the field of production, operation, maintenance, and repair of locomotives and multiple-unit rolling stock;

– Educational institutions and other related entities.

Types of professional activity:

- Production and technological;
- Organizational and managerial;
- Service and operational;
- Maintenance and repair;
- Scientific and pedagogical;
- Quality assessment;
- Research activity.

The functions and key competencies of professional activity are presented in Tables 2–6:

Table 2: Job Functions, Professional Skills, and Competencies According to the Professional Standard «Quality Management»

Profession Card 1: Chief Quality Manager		
Primary Objective of Activity:	Development and implementation of a quality management system for products (services) within the organization.	
Job Functions:	Mandatory Job Functions:	Development and implementation of a quality management system for products (services).
Job Function 1: Development and Implementation of a Quality Management System for Products (Services)	Task 1: Designing the Structure of the Quality Management System for Products (Services)	Skills: 1. Determining the scope and boundaries for implementing the quality management system for products (services). 2. Conducting systemic analysis of quantitative and qualitative performance indicators of the organization's subsystems. 3. Developing methodological recommendations for the implementation of the quality management system for products (services). 4. Analyzing and assessing resource support for the implementation of the quality management system. 5. Documenting the implementation process of the quality management system for products (services). 6. Organizing audits of organizational processes and subsystems.
	Task 2: Organizing the Quality Management System for Products (Services)	Skills: 1. Applying planning methods when developing an implementation plan for the quality management system. 2. Engaging in business communication within working groups during the development and implementation of the quality management system. 3. Coordinating the activities of working groups involved in developing and implementing the quality management system.

		4. Preparing supporting documentation. 5. Conducting business correspondence and negotiations with counterparties.
	Task 3: Monitoring the Implementation of the Quality Management System for Products (Services)	Skills: 1. Monitoring and assessing the performance indicators of organizational subsystems and staff. 2. Controlling the quality of documentation development related to the quality management system. 3. Analyzing technical and administrative documentation. 4. Identifying and evaluating deviations in performance indicators and their significance. 5. Coordinating the activities of working group members.
	Task 4: Risk Management in the Implementation of the Quality Management System for Products (Services)	Skills: 1. Identifying risks in the implementation of the quality management system. 2. Assessing the impact of risks on the quality management system. 3. Developing mechanisms for risk mitigation. 4. Drafting a risk mitigation action plan. 5. Monitoring the execution of the action plan. 6. Coordinating the activities of working group members.

Table 3. Labor functions and professional skills and competencies according to the Professional Standard «Teacher (faculty) of higher and (or) postgraduate education organizations»

Profession Card 2: Lecturer, Assistant in the Field of Higher and Postgraduate Education (HPE)		
Job Title:	Lecturer, Assistant in the Field of Higher and Postgraduate Education	
Key Purpose of Activity:	Carries out academic, research, methodological, and public activities within higher and postgraduate education organizations (HPE).	
List of Labor Functions	Mandatory Labor Functions:	1. Teaching 2. Conducting Scientific Research 3. Carrying Out Methodological Work 4. Socialization of Students
Description of Labor Functions		
Labor Function 1: Teaching	Skill 1: Ensuring the required level of students' academic competencies	Abilities: 1. Organize and conduct academic classes (excluding lectures) based on the principles of student-centered learning and assessment; 2. Develop instructional and methodological materials for the disciplines taught, taking into account the integration of education, science, and innovation; 3. Establish feedback mechanisms with undergraduate students using digital technologies.

	Skill 2: Ensuring the required level of students' professional competencies	Abilities: 1. Take into account the specific features of the profession (according to the higher education field of study) when conducting academic classes; 2. Integrate professional innovations (according to the higher education field of study) into the educational process.
Labor Function 2: Conducting Scientific Research	Skill 1: Ensuring the integration of science, higher education, and the labor market	Abilities: 1. Participate in scientific research and experimental design projects / creative projects; 2. Improve scientific productivity and increase publication activity; 3. Work with national and international research databases.
	Skill 2: Developing the required level of students' research skills	Abilities: 1. Diagnose the research skills of undergraduate students; 2. Apply strategies for developing and supporting undergraduate students' research/creative activities and publication engagement.
Labor Function 3: Implementation of Scientific and Methodological Work	Skill 1: Scientific and methodological support of macroprocesses in higher and (or) postgraduate education organizations (HPHEO)	Abilities: 1. Carry out academic and methodological work and develop methodological competence; 2. Improve professional qualifications; 3. Ensure the integration of psychological-pedagogical knowledge and subject-specific knowledge during seminar/practical classes in undergraduate programs; 4. Apply modern and innovative (including digital) teaching technologies.
Labor Function 4: Socialization of Students	Skill 1: Promotion of Social Values within the Student Environment	Abilities: 1. Support and enhance the educational environment and organizational culture in accordance with the policies and procedures of higher and (or) postgraduate education organizations (HPHEO); 2. Contribute to the development of civic and professional engagement among students; 3. Adhere to the principles of academic integrity and ethical conduct.
	Skill 2: Fostering Students' Commitment to the Values of Their Chosen Profession	Abilities: 1. Cultivate a sustainable interest in the chosen profession among students; 2. Adhere to anti-corruption principles.
Additional Labor Function: Interaction with Stakeholders in	Skill 1: Interaction with Internal Stakeholders	Abilities: 1. Establish optimal communication with students, colleagues, and staff of higher and postgraduate education organizations;

Higher and Postgraduate Education		2. Work collaboratively with colleagues and staff within these organizations.
	Skill 2: Interaction with External Stakeholders	Abilities: 1. Engage students in social youth movements and organizations; 2. Involve employers in the process of preparing future specialists; 3. Develop and implement professional development course programs for industry personnel in the relevant field; 4. Publish relevant and timely articles in various media outlets and social networks.

Table 4. Labor Functions, Professional Skills, and Competencies According to the Professional Standard «Operation of Locomotives and Multiple Unit Rolling Stock»

Profession Card 3: Head of the Locomotive Depot		
Purpose of Activity:	Organization and management of the enterprise's work plan implementation and performance indicators, ensuring train traffic safety, occupational and industrial safety, fire safety, and industrial hygiene compliance.	
Labor Functions:	Mandatory Labor Functions:	1. Organizing work to ensure train traffic safety. 2. Supervising and organizing the work of deputy depot heads, driver instructors, and department heads. 3. Concluding and terminating employment contracts and staff placement. 4. Maintaining depot infrastructure in accordance with sanitary and environmental standards. 5. Organizing documentation and technical support, planning and managing the working time of all depot employees.
Labor Function 1: Organizing Work to Ensure Train Traffic Safety	Task 1: Preparing Locomotive Crew Workers to Act in Non-Standard Situations During Train and Shunting Operations	Skills: 1. Organize the work of driver instructors for locomotive crews. 2. Assess the knowledge level of depot employees in the field of locomotive operations. 3. Evaluate the effectiveness of implemented technical training plans. 4. Make decisions in cases of unsatisfactory preparation of locomotive crew workers for non-standard situations during train and shunting operations.
	Task 2: Developing and Implementing Plans to Prevent Violations of Train Traffic Safety and Passing of Stop Signals	Skills: 1. Apply various methods to improve train traffic safety. 2. Delegate responsibilities and determine the level of employee accountability. 3. Analyze the outcomes of the work performed according to the assigned plan.

		4. Make decisions on adjusting safety violation prevention plans.
	Task 3: Maintaining the Locomotive Fleet in Technically Sound Condition	Skills: 1. Manage mid-level personnel directly responsible for performing locomotive maintenance (service). 2. Monitor the quality of performed locomotive maintenance (service). 3. Make decisions to improve the quality of locomotive maintenance.
Labor Function 2: Supervision and Organization of the Work of Deputy Depot Heads, Driver Instructors, and Department Heads	Task 1: Conducting Planning Meetings with Deputy Depot Heads, Driver Instructors, and Department Heads	Skills: 1. Prevent and resolve conflict situations. 2. Evaluate employee performance in fulfilling work plans. 3. Assign tasks to deputies related to the implementation of operational plans.
	Task 2: Receiving and Reviewing Work Reports from Deputy Depot Heads and Driver Instructors	Skills: 1. Analyze staff performance. 2. Coordinate the activities of deputy depot heads. 3. Assign tasks to deputies in accordance with plan fulfillment objectives.
Labor Function 3: Maintenance of Depot Infrastructure in Accordance with Sanitary and Environmental Standards	Task 1: Task Assignment for Maintenance of Depot Infrastructure According to Sanitary and Environmental Standards	Skills: 1. Define a work plan for maintaining depot infrastructure in compliance with sanitary and environmental regulations. 2. Monitor the condition and upkeep of depot infrastructure to ensure conformity with sanitary and environmental standards.
	Task 2: Compliance with All Approved Norms and Procedures in Accordance with Sanitary and Environmental Standards	Skills: 1. Evaluate the outcomes of maintenance work. 2. Participate in unannounced inspections.
Labor Function 4: Organization of Documentation and Technical Support, Planning and Utilization of Working Time for All Depot Employees	Task 1: Organization and Improvement of the Documentation Management System within the Organization	Skills: 1. Organize the work of employees. 2. Define performance evaluation criteria for each employee. 3. Organize workplaces and ensure favorable working conditions.

Table 5. Labor Functions, Professional Skills, and Competencies According to the Professional Standard «Quality Control Inspection of Locomotives After Repair»

Profession Card 4: Head of Locomotive Repair Quality Control		
Purpose of the Role:	To organize and coordinate activities related to quality control of locomotive repair, technical and service maintenance, as well as investigation of locomotive failures en route and handling warranty claims.	
Job Functions	Mandatory Job Functions:	1. Organization of the activities of department staff. 2. Carrying out investigations of cases involving locomotives entering unscheduled (between-train) repairs. 3. Preparation of documentation and reports. 4. Control over production and labor discipline of department employees.
Job Function 1: Organization of the activities of department staff	Task 1: Planning the department's work	Skills:
		1. Distribute workload among department employees. 2. Prepare tasks for each employee. 3. Communicate the objective of the assignment to the executor. 4. Assign responsible executors.
	Task 2: Analyzing activities	Skills:
		1. Assess the technical proficiency of employees and their performance. 2. Use information sources when organizing the development of forecasts for economic and social development of the railway transport organization's subdivision. 3. Analyze information provided in reports related to the development plans of the railway transport organization's subdivision by direction. 4. Evaluate the effectiveness achieved through the implementation of production technological and technical development plans. 5. Make decisions on adjustments to the development plans of the railway transport organization's subdivision.
	Task 3: Monitoring task performance	Skills:
		1. Monitor the timely submission of reports to higher management. 2. Ensure compliance with local regulatory acts. 3. Ensure compliance with occupational safety, electrical safety, and fire safety requirements. 4. Monitor the scheduling of locomotives for maintenance based on their standard mileage.
Job Function 2: Conducting investigations of cases involving	Task 1: Investigating cases of locomotives entering BTR and train traffic	Skills:
		1. Prepare materials for review involving representatives of related repair enterprises and locomotive crews.

locomotives entering between-train repairs (BTR)	safety violations due to locomotive malfunctions	2. Develop preventive measures to avoid unscheduled detachment of locomotives.
	Task 2: Processing all necessary documentation for each case of locomotive entry into BTR based on investigation results	Skills: 1. When necessary, prepare a claim report (reclamation act), based on current regulations, contracts, and instructions. After collecting all materials, submit them to the planning and economic department of the branch to ensure timely compensation for the material damage caused by the responsible enterprises and individuals. 2. Prepare case materials involving representatives of relevant repair enterprises and locomotive crews, by collecting explanations from those involved and gathering other documents confirming the violations.
Job Function 3: Document and report preparation	Task 1: Carrying out preparatory work for developing measures related to spring–autumn commission inspections of locomotives	Skills: 1. Compile reports. 2. Maintain records of completed tasks and manage documentation. 3. Determine the number of locomotives subject to inspection.
Job Function 4: Control over production and labor discipline of department employees	Task 1: Coordination of department employees' actions	Skills: 1. Organize the provision of workplaces with technical equipment and necessary materials. 2. Instruct employees on documentation procedures, processing, and recordkeeping. 3.Apply methods for organizing departmental activities.

Table 6. Job Functions, Professional Skills, and Competencies according to the Professional Standard «Control of Quality Inspection of Locomotives after Repair»

Job Profile Card 5: «Head of the Reserve Base of the Locomotive Depot»		
Purpose of Activity:	Technical supervision of locomotives and multiple units listed in reserve.	
Job Functions:	Mandatory Job Functions:	1. Organization of the work of the locomotive reserve base to ensure timely and high-quality performance of tasks related to the maintenance of conserved locomotives for long-term storage. 2. Monitoring compliance with labor and production discipline by the employees of the reserve base.
Job Function 1: Organization of the work of the locomotive reserve base to ensure	Task 1: Preparation of a schedule for technical maintenance, test runs, and inspections	Skills: 1. Coordinate the work of the reserve base personnel. 2. Make decisions to improve the quality of locomotive maintenance.

timely and high-quality performance of tasks related to the maintenance of conserved locomotives for long-term storage.	of locomotives and multiple units.	3. Apply advanced practices.
	Task 2: Organization of the reserve base's operations to ensure timely and high-quality performance of tasks for maintaining locomotives under long-term conservation.	Skills: 1. Ensure the efficient use of materials for repair work. 2. Participate in the development of plans to improve production efficiency. 3. Motivate employees.
	Task 3: Preparation of information on the availability and technical condition of locomotives and multiple units.	Skills: 1. Prepare reports. 2. Evaluate performance. 3. Analyze and develop proposals for personnel management.
Job Function 2: Monitoring compliance with labor and production discipline by the personnel of the locomotive reserve base.	Task 1: Conduct technical training sessions with reserve base personnel.	Skills: 1. Train direct subordinates, provide guidance, motivate, supervise, and monitor their activities. 2. Create conditions for employee training. 3. Introduce new technologies. 4. Assess the qualification level of reserve base personnel for performing technical maintenance of locomotives (multiple units). 5. Organize the study of regulatory documents on the safe technical maintenance of locomotives (multiple units). 6. Make decisions regarding the need for further training and skills development of employees.
	Task 2: Conduct production briefings for the reserve base personnel.	Skills: 1. Present materials clearly and provide necessary methodological assistance in mastering knowledge on the technical maintenance of locomotives (multiple units). 2. Assess the level of information comprehension. 3. Organize practical demonstrations on ensuring safe technical maintenance of locomotives (multiple units).
	Task 3: Monitor the maintenance of cleanliness and order on the assigned territory and within the workshop premises.	Skills: 1. Conduct awareness and disciplinary work with personnel to ensure cleanliness and order. 2. Enforce fire safety requirements and implement measures for environmental protection on the reserve base territory. 3. Hold meetings with the team.

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.

Tasks of EP:

1. Knowledge and Application

– Develop a deep understanding of the fundamental principles and innovative methods for the operation and maintenance of rolling stock.

– Train students to apply theoretical knowledge in practice for diagnosing and repairing rolling stock.

2. Analytical Skills

– Develop the ability to analyze and evaluate current methods and technologies in the operation and maintenance of rolling stock.

– Train students to conduct research and develop improved methods for operating and maintaining rolling stock.

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

3. Practical Skills

– Equip students with practical skills in using modern tools and technologies for rolling stock maintenance.

– Provide students with practical skills for monitoring and assessing the condition of locomotives, as well as using technologies to improve reliability and safety.

– Organize research internships and practical training for students at railway industry enterprises.

4. Critical Thinking and Problem Solving

– Develop critical thinking and the ability to solve complex technical problems.

– Train students to seek out and implement innovative solutions to improve the efficiency and safety of rolling stock operation and maintenance.

5. Communication and Interpersonal Skills

– Teach students to work in teams, communicate effectively, and collaborate with colleagues and industry professionals.

– Develop students’ skills in presenting and defending their ideas and projects.

6. Research Competencies

– Develop students' skills in conducting research in the field of rolling stock operation and maintenance.

– Train students to design and implement research projects aimed at improving methods of operation and maintenance.

7. Sustainable Development Competencies

– Educate students on the principles of sustainable development and their application in rolling stock operation and maintenance.

– Develop skills for identifying and implementing environmentally safe and economically efficient solutions.

8. Pedagogical Competencies

– Develop teaching and instructional skills, including lesson planning and the development of educational materials.

– Train students in methods of transferring knowledge and experience to colleagues and new employees.

3. Requirements for evaluating the educational program learning outcomes

The educational program «7M07140 – Railway Transport» ensures that all students achieve the intended learning outcomes required for professional activity.

The main principles of learning outcomes assessment are as follows:

– Objectivity, reliability, and transparency in the presentation of information;

– Focus on improving teaching and the learning process;

– Alignment of assessment tools with the learning outcomes defined in the State and subject-specific standards;

– Compliance of norms, requirements, and indicators of student educational achievements with their abilities, interests, social demands, and personal development requirements;

– Systematic analysis of interim and final results of student learning achievements;

– Adherence to basic ethical standards in the assessment process.

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

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

Formative assessment is applied to monitor the learner’s progress while taking into account individual characteristics of material assimilation (pace of work, methods of mastering the topic, etc.). It is also used to provide recommendations for success. The instructor uses formative assessment to make timely adjustments to teaching and lesson planning, while students use it to improve the quality of their work.

Student progress is defined as the achievement of specific results set in the learning goals within subject areas, based on actual work completed by the student. The teacher records observations on individual student progress in the electronic gradebook.

Summative assessment is used to determine the degree to which the student has achieved the intended learning outcomes at each stage of education. It consists of ongoing (current), midterm (interim), and final assessments.

Current assessment of individually completed assignments is carried out based on assessment norms (number of correct solutions, number of errors, adherence to formatting rules, etc.) and criteria defined by the teacher and/or students. The teacher considers the student’s individual learning characteristics when conducting current assessment.

Midterm assessment is based on the types of work specified in the course syllabus: written assignments/source analysis; oral responses/presentations; projects, research work, specific practical tasks; portfolios (achievement folders),

and others. All types of work are evaluated using predetermined criteria and are mandatory. They are planned in advance by the teacher as part of the assessment plan.

Final assessment is conducted according to the academic calendar and is administered in written form, in accordance with established standards and developed assessment criteria.

4. Passport of educational program

4.1. General information

№	Field name	Comments
1	Code and classification of the field of education	7M07 – Engineering, manufacturing and construction industries
2	Code and classification of training directions	7M071 – Engineering and Engineering affairs
3	Educational program group	M104 – Transport, transport equipment and technologies
4	Educational program name	7M07140 – «Railway transport»
5	Short description of educational program	The educational program 7M07140 – «Railway Transport» is aimed at training highly qualified specialists in the field of production, operation, and maintenance of locomotives and multiple unit rolling stock. The program has been developed based on the Sectoral Qualifications Framework for the «Railway Transport» field in accordance with the following Professional Standards: – Operation of Locomotives and Multiple Unit Rolling Stock; – Quality Control of Locomotives after Repair; – Quality Management; – Pedagogue (Faculty) of Higher and/or Postgraduate Education Institutions. The program has been updated to provide academic support for SDGs 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	7
9	The level based on IQF	7
10	Distinctive features of EP	No
11	List of competencies of educational program	General Competencies: GC 1 – Ability to analyze and evaluate complex technical data and make informed decisions based on analysis. GC 2 – Ability to interact effectively with colleagues, subordinates, and management; conduct negotiations and work in a team. GC 3 – Awareness of the importance of adhering to professional standards, ethical norms, and safety

№	Field name	Comments
		regulations in the workplace. GC 4 – Ability to effectively plan and organize one's work, allocate time and resources to achieve set goals. GC 5 – Ability to conduct scientific research, analyze obtained data, and present results in the form of reports and scientific publications. Professional Competencies: PC 1 – Knowledge of the principles of operation and maintenance of rolling stock; ability to apply this knowledge in practice to ensure uninterrupted railway transport operations. PC 2 – Proficiency in modern methods and technologies for rolling stock repair; ability to develop and implement effective maintenance and repair technologies. PC 3 – Ability to develop and implement quality management systems in railway transport, conduct quality audits, and take measures to improve the reliability and safety of rolling stock operations. PC 4 – Knowledge of diagnostic methods and tools for assessing the technical condition of locomotives; ability to identify and eliminate faults. PC 5 – Knowledge of modern technologies and innovations in the operation and repair of rolling stock; ability to implement and adapt these technologies in professional practice. PC 6 – Knowledge of methods for minimizing the negative environmental impact of rolling stock operation; ability to implement environmentally friendly technologies. PC 7 – Ability to develop and implement energy-efficient solutions in the operation and maintenance of rolling stock, reducing energy consumption and emissions. PC 8 – Ability to develop and implement sustainable transport management systems, taking into account social, economic, and environmental factors in professional activities. Scientific and Pedagogical Competencies: PC 9 – Ability to design educational programs and deliver instruction in the field of specialization, as well as mentor junior specialists and students. PC 10 – Ability to develop methodological materials, textbooks, and manuals for students. PC 11 – Ability to assess the quality of education, analyze learning outcomes, and develop measures for improvement.

№	Field name	Comments
12	Learning outcomes of educational program	LO1 – To make strategic and managerial decisions taking into account psychological characteristics of the individuals and a team. LO2 – To solve the tasks of improving the effectiveness of structures and technical and operational parameters of rolling stock, on the basis of theoretical and experimental studies, in order to ensure traffic safety and the efficiency of rolling stock use. LO3 – To design new structures of rolling stock, using the concept of extending life extensity, via the use of resource and energy conservation, as well as new technologies LO4 – To develop management solutions for operational reliability and functional safety of rolling stock based on international quality standards LO5 – To solve problems related to ensuring environmental protection, using legislative framework of environmental design and expertise LO6 – To solve complex engineering problems in skilled work and scientific research using methods of complex analysis, mathematical statistics and modeling LO7 – To organize work to ensure the safety and efficient operation of rolling stock in order to ensure the sustainable development of transport LO8 – To interpret the results of scientific research in oral and written form in a foreign language. LO9 – To explore the history and philosophy of science as a system of concepts of global and Kazakh science, considered in a complex of scientific humanities, natural and applied information. LO10 – To develop normative-technical, scientific and educational-methodical documentation based on the new knowledge in the field of qualified work LO11 – To solve scientific and pedagogical tasks, taking into account new technologies in the field of higher education. LO12 – To develop educational and methodological materials on the subjects taught, taking into account the integration of education, science and innovation LO13 – To assess the impact of transport systems and processes on human health and the environment
13	Education form	Full-time
14	Period of training	2 year
15	Amount of credits	120
16	Languages of instruction	Russian, Kazakh
17	Academic degree awarded	Master of Technical Sciences
18	Developers and authors	Abdullaev S.S., Kamzanov N.S., Tokmurizna-Kobernyak N.A. employer: Imentaeva S.G. student: Kayratova A.Ye.

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 basic disciplines University component																
1	Foreign language (professional)	Mastering professional English at an advanced level (for non-linguistic areas). The study of grammatical characteristics of scientific style in its oral and written forms. Professional oral communication in monological and dialogical form according to the educational program. Ability to demonstrate the results of research in the form of reports, abstracts, publications and public discussions; interpret and present the results of scientific research in a foreign language.	**3**								**v**					
2	History and philosophy of science	Purpose: to explore the history and philosophy of science as a system of concepts of global and Kazakh science. Content: the subject of philosophy of science, dynamics of science, the main stages of the historical development of science, features of classical science, non-classical and post-non-classical science, philosophy	**3**								**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
		of mathematics, physics, engineering and technology, specifics of engineering sciences, ethics of science, social and moral responsibility of a scientist and engineer.														
3	Higher school pedagogy	The course is aimed at mastering the methodological and theoretical foundations of higher education pedagogy. The discipline will help to master the skills of modern pedagogical technologies, technologies of pedagogical design, organization and control in higher education, skills of communicative competence. At the end of the course, undergraduates learn how to organize and conduct various forms of organizing training, apply active teaching methods, and select the content of training sessions. Organize the educational process on the basis of credit technology of education.	**3**										**v**	**v**	**v**	
4	Psychology of management	The course is aimed at mastering the tools for effective employee management, based on knowledge of the psychological mechanisms of the manager's	**3**	**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
		activity. Discipline will help you master the skills of making decisions, creating a favorable psychological climate, motivating employees, setting goals, building a team and communicating with employees. At the end of the course, undergraduates will learn how to resolve managerial conflicts, create their own image, analyze situations in the field of managerial activity, as well as negotiate, be stress-resistant and effective leaders.														
5	Assessment of the sustainability of transport development	Objective: to acquire skills in developing strategies and solutions aimed at minimizing the negative impact of transport on the environment and society. Content: Global challenges in the field of sustainable development. Strategies and technologies to reduce the environmental impact of transport. Assessing the costs and benefits of sustainable transport solutions. Methods and tools for assessing sustainable transport development. Indicators of sustainable transport development.	**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
Cycle of basic disciplines Component of choice																
6	Intellectual property and research	The purpose of this course is to provide undergraduates with the knowledge and skills necessary to understand, protect and manage intellectual property (IP) in the context of scientific research and innovation. The course is aimed at training specialists who can effectively work with IP, protect the results of scientific research and apply them in practice.	**5**	**v**												
7	Sustainable development strategies	Purpose: To train graduate students in sustainable development strategies to achieve a balance between economic growth, social responsibility, and environmental protection. Content: Graduate students will study the concepts and principles of sustainable development, the development and implementation of sustainable development strategies, the evaluation of their effectiveness, and international standards and best practices. Cases and examples of successful sustainable	**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
		development strategies are included.														
8	Quality management strategy and fundamentals of railway transport reliability	Objective: to develop the ability of quality management to improve the reliability of rolling stock. Contents: reliability management of complex technical systems; calculation of reliability indicators, methods of collecting and analyzing information about reliability; calculation and evaluation of production quality indicators on railway rolling stock.	**5**	**v**	**v**		**v**									
9	Organization and management of railway transport enterprises	Purpose: formation of professional competencies in the field of organization, planning and management of a railway transport enterprise and independent decision-making on planning and optimization of production processes. Contains modules: general information about the transport enterprise; locomotive and wagon depot, repair enterprises: locomotive and wagon facilities, locomotive and wagon factories; organization, planning and management at the enterprise.	**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
10	Quality management systems for the operation and repair of railway transport	Objective: to acquire skills in developing management solutions for the operation and repair of railway transport based on international quality standards. Contents: ISO 9001 standards; quality management during operation and maintenance of rolling stock; process approach to organization management; organization, types and methods of technical quality control; development and implementation of quality systems in locomotive and wagon depots.	**5**	**v**			**v**		**v**				**v**			
Cycle of profile disciplines University component																
11	Modern railway rolling stock	Objective: to acquire skills in designing new rolling stock structures using the concept of extending the life cycle Contents: fundamentals and principles of improving the design and operation of modern railway rolling stock; the main ways to improve the interaction of track and rolling stock in the environmental aspect; analysis and determination of necessary measures to improve the design	**5**		**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 operation of modern railway rolling stock.														
12	Technological calculation and design of railway rolling stock	Purpose: to develop skills in designing (modeling) railway rolling stock systems. Contents: methods for calculating and evaluating the strength of structural elements of rolling stock; technical and economic methods of calculation and design; rules and methods of design; basic provisions of technological calculation of rolling stock, planning and conducting scientific research to find and verify new ideas for improving the design of rolling stock.	**5**		**v**	**v**			**v**							**v**
13	Fundamentals of scientific research in transport	Purpose: to acquire the skills of conducting scientific research. Contents: Study of the basics and methods of scientific research; the concept of science in the transport industry of the Republic of Kazakhstan; formulation of the topic, goals and objectives of scientific research; methodology of theoretical and experimental research; analysis of theoretical and experimental research and	**5**						**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
		formulation of conclusions and conclusions; innovative methods of generating ideas in solving scientific and technical problems.														
14	Methods of testing railway transport	Purpose: to develop practical skills in planning, staging and conducting experimental scientific research, searching for and testing new ideas for improving railway rolling stock. Contents: regulatory and technical base for testing rolling stock; equipment used for testing rolling stock; dynamic, static and vibration tests of rolling stock components; automation of experimental research and processing of experimental data.	**5**		**v**				**v**		**v**	**v**				
15	Theory of setting up an engineering experiment	Purpose: To get acquainted with existing methods, approaches to solving engineering problems, with planning methods, the procedure for conducting, processing and analyzing the results of an engineering experiment. Contents: fundamentals of experimental theory, methods of planning experiments, processing experimental results. The theory of experiment planning	**4**		**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
		formulates techniques and methods for the optimal organization of experimentation in the study of objects of a wide variety of physical nature.														
Cycle of profile disciplines Component of choice																
16	Innovative methods of machine repair and maintenance	Purpose: to master innovative methods of repair and maintenance of machines. Contents: advanced maintenance and repair systems, machine life cycle management; standards, patterns and their interrelation; methods of management of transport enterprises and organization of logistics.	**5**				**v**		**v**							
17	Environmentally friendly ways to restore machine parts	Purpose: to acquire skills in technological tasks related to ensuring environmental protection during the restoration of machine parts. Contents: modern technologies for the restoration of parts used in the performance of repair and restoration work; environmental assessment of design solutions.	**5**				**v**	**v**	**v**							**v**
18	Technology of operation and maintenance of railway rolling stock	Purpose: forms the ability to plan and organize processes related to the technical operation and maintenance of rolling stock.	**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
		Content: Requirements for the organization of technical and service maintenance of rolling stock; formation and optimization of the rolling stock maintenance system; digital technologies, automated control systems and diagnostic condition monitoring systems used in the operation of railway transport.														
19	Organization of operation and safety of railway transport	Objective: to develop managerial skills in the organization of operation and ensuring traffic safety in railway transport. Contents: organization of rolling stock operation, landfill technologies, train schedule; safety rules for railway transport; operational planning and management of operational work of railway divisions, increasing the capacity and carrying capacity of railway lines, development and analysis of train schedules.	**5**				**v**	**v**	**v**							**v**
20	Resource saving and energy saving in railway transport	Purpose: develops the ability to make decisions in the field of professional activity based on the principles of resource and energy conservation. Contents: Types and characteristics of various	**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
		energy resources; regulatory and legal support for energy conservation; ways to increase the energy efficiency of the transportation process; resource-saving technologies in repair production and operation of railway infrastructure facilities; organization and methods of energy conservation management.														
21	Environmental safety of railway transport	Objective: to acquire skills in solving problems related to ensuring environmental protection. Contents: basic requirements for environmental quality, regulatory and legal acts in the field of environmental protection, technical and economic methods for reducing the harmful effects of rail transport on the atmosphere, hydrosphere, soil, as well as methods for reducing energy pollution.	**5**					**v**	**v**							**v**
22	Rolling stock of high-speed rail transport	Objective: to gain skills in evaluating the design and technical and economic characteristics of rolling stock. Contents: innovative solutions in the design, technology of	**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
		operation and maintenance of high-speed rolling stock, methods for calculating and evaluating usage indicators and evaluating the effectiveness of the use of rolling stock, development of recommendations for improving the design and technology of operation.														
23	Interaction of rolling stock and railway track	The purpose of the discipline: the formation of professional competencies in the field of methods for calculating and evaluating indicators of dynamic qualities of rolling stock and track Contents: Mechanical system "crew-path", interaction forces, mechanical processes and dynamic models of interaction between crew and track, calculation and evaluation of dynamic parameters of rolling stock and track.	**5**		**v**				**v**		**v**					**v**
24	Fundamentals of computer modeling of railway transport	Purpose: to acquire modeling skills in the design and control of the condition of components and assemblies of rolling stock. Contents: formation of a mathematical model of an object; methods of implementing a	**5**		**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
		mathematical model, determining the sequence of constructing mathematical models of processes in devices and systems of railway rolling stock; application of special professional rolling stock modeling programs.														
25	Assessment of environmental indicators of design solutions	Objective: to acquire skills in solving problems related to ensuring environmental protection. Contents: environmental legislation in the field of transport; negative impacts of railway transport facilities on the environment, monitoring and methods for assessing the negative impact on the atmosphere, hydrosphere, soil, flora and fauna; environmental design and project expertise.	**5**					**v**	**v**							**v**

NON-PROFIT JOINT STOCK COMPANY
"KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY NAMED AFTER K.I. SATBAYEV"

SATBAYEV UNIVERSITY

«APPROVED»
Decision of the Academic Council
NPJSC«KazNRTU
named after K.Satbayev»
dated 06.03.2025 Minutes № 10

WORKING CURRICULUM

Academic year — **2025-2026 (Autumn, Spring)**

Group of educational programs — **M104 - "Transport, transport equipment and technologies"**

Educational program — **7M07140 - "Railway transport"**

The awarded academic degree — **Master of Technical Sciences**

Form and duration of study — **full time (scientific and pedagogical track) - 2 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		
									1 sem	2 sem	3 sem	4 sem	
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)													
CYCLE OF BASIC DISCIPLINES (BD)													
M-1. Module of basic													
LNG213	Foreign language (professional)		BD, UC	3	90	0/0/30	60	E	3				
HUM214	Psychology of management		BD, UC	3	90	15/0/15	60	E	3				
HUM212	History and philosophy of science		BD, UC	3	90	15/0/15	60	E		3			
HUM213	Higher school pedagogy		BD, UC	3	90	15/0/15	60	E		3			
M-2. Transport sustainability and quality management in rail transport													
TRA290	Organization and management of railway transport enterprises	1	BD, CCH	5	150	30/0/15	105	E	5				
TRA291	Quality management systems for the operation and repair of railway transport	1	BD, CCH	5	150	30/0/15	105	E	5				
MNG781	Intellectual property and research	1	BD, CCH	5	150	30/0/15	105	E	5				
TRA293	Quality management strategy and fundamentals of railway transport reliability	2	BD, CCH	5	150	30/0/15	105	E	5				
MNG782	Sustainable development strategies	2	BD, CCH	5	150	30/0/15	105	E	5				
TRA712	Assessment of the sustainability of transport development		BD, UC	5	150	30/0/15	105	E			5		
M-5. Practice-oriented module													
AAP235	Pedagogical Practice		BD, UC	3				R		3			
AAP277	Pedagogical practice		BD, UC	5				R				5	
CYCLE OF PROFILE DISCIPLINES (PD)													
M-3. Innovations in rail transport													
TRA281	Modern railway rolling stock		PD, UC	5	150	30/0/15	105	E	5				
TRA268	Innovative methods of machine repair and maintenance	1	PD, CCH	5	150	30/0/15	105	E		5			
TRA269	Environmentally friendly ways to restore machine parts	1	PD, CCH	5	150	30/0/15	105	E		5			
TRA284	Technological calculation and design of railway rolling stock		PD, UC	5	150	30/0/15	105	E			5		
TRA289	Technology of operation and maintenance of railway rolling stock	1	PD, CCH	5	150	30/0/15	105	E			5		
TRA288	Organization of operation and safety of railway transport	1	PD, CCH	5	150	30/0/15	105	E			5		
TRA286	Environmental safety of railway transport	2	PD, CCH	5	150	30/0/15	105	E			5		
TRA287	Resource saving and energy saving in railway transport	2	PD, CCH	5	150	30/0/15	105	E			5		

M-4. Theoretical and experimental research in railway transport													
TRA279	Fundamentals of scientific research in transport		PD, UC	5	150	30/0/15	105	E	5				
TRA285	Methods of testing railway transport		PD, UC	5	150	30/0/15	105	E		5			
TRA294	Interaction of rolling stock and railway track	1	PD, CCH	5	150	30/0/15	105	E		5			
TRA295	Assessment of environmental indicators of design solutions	1	PD, CCH	5	150	30/0/15	105	E		5			
TRA280	Rolling stock of high-speed rail transport	2	PD, CCH	5	150	30/0/15	105	E		5			
TRA283	Fundamentals of computer modeling of railway transport	2	PD, CCH	5	150	30/0/15	105	E		5			
TRA701	Theory of setting up an engineering experiment		PD, UC	4	120	30/0/15	75	E			4		
M-5. Practice-oriented module													
AAP256	Research practice		PD, UC	4				R				4	
M-6. Experimental research module													
AAP268	Research work of a master's student, including internship and completion of a master's thesis		RWMS	4				R	4				
AAP272	Research work of a master's student, including internship and completion of a master's thesis		RWMS	1				R		1			
AAP254	Research work of a master's student, including internship and completion of a master's thesis		RWMS	5				R			5		
AAP255	Research work of a master's student, including internship and completion of a master's thesis		RWMS	14				R				14	
M-7. Module of final attestation													
ECA212	Registration and protection of the master thesis		FA	8								8	
Total based on UNIVERSITY:									30	30	29	31	
									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	0	0	0	0
BD	Cycle of basic disciplines	0	25	10	35
PD	Cycle of profile disciplines	0	28	25	53
Total for theoretical training:		**0**	**53**	**35**	**88**
RWMS	Research Work of Master's Student				24
ERWMS	Experimental Research Work of Master's Student				0
FA	Final attestation				8
TOTAL:					**120**

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. Б.
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 ____Acknowledged____	Beketov T.