NJSC SHAKARIM UNIVERSITY OF SEMEY

EDUCATIONAL PROGRAM

6B07 - Engineering, Manufacturing and Civil engineering
(Code and classifcation of the feld of education)

6B071 - Engineering and engineering trades
(Code and classifcation of the direction of training)

0710
(Code in the International Standard Classifcation of Education)

B062 - Electrical engineering and power engineering
(Code and classifcation of the educational program group)

6B07103 - Power Engineering
(Code and name of the educational program)

Bachelor
(Level of preparation)

Semey

Educational program

6B07 -- Engineering, manufacturing and construction industries
(Code and classification of the field of education)

6B071 - Engineering and Engineering affairs
(Code and classification of the direction of training)

0710
(Code in the International Standard Classification of Education)

B062 - Electrical engineering and power engineering
(Code and classification of the educational program group)

6B07103 - Heat Power Engineering
(Code and name of the educational program)

bachelor
(Level of preparation)

Semey 2024

PREFACE

Developed

The educational program 6B07103 - Heat Power Engineering in the direction of preparation 6B071 - Engineering and Engineering affairs on the basis of the State Compulsory Standards of Higher and Postgraduate Education approved by the Order of the Ministry of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No 2 (as amended by the order) was developed by the Academic Committee dated 20.02.2023 No 66).

Members of the Academic Committee	Full name	Academic degree, academic title, position
Head of the Academic Committee	Kassymov Askar Bagdatovich	Dean of the Research School of Physical and Chemical Sciences
Educational program manager	Umyrzhan Temirlan Nurlanuly	Senior lecturer of the department of «Technical Physics and Heat Power Engineering»
Member of the AC	Stepanova Olga Aleksandrovna	Head of Department «Technical Physics and Heat Power Engineering»
Member of the AC	Zarykbayeva Kamshat Serikkhanovna	Senior lecturer of the department of «Technical Physics and Heat Power Engineering»
Member of the AC	Zhumagazhinov Askar Tokishevich	Leading engineer of the production and technical department
Member of the AC	Kuzkenov Almas Salakidenovich	Head of CHPP-1 State Enterprise Teplocommunenergo
Member of the AC	Aitkazin Bislan Erbulatovich	Student of the TE - 101 group of the Educational Program 6B07103 - Heat Power Engineering
Member of the AC	Skakova Rinata Toktarovna	Student of the TE - 101 group of the educational program 6B07103 - Heat Power Engineering

Reviewing

Full name of the reviewer	Position, place of work
Demin Nikolay Aleksandrovich	Deputy Director for Production of the State -Owned Enterprise «Teplokommunenergo»
Isagalieva Shynasyl Kairatkyyzy	State Enterprise «Teplokommunenergo» regime engineer

Reviewed

At the meeting of the Academic Quality Commission of the Faculty of Engineering and Technology
Protocol №3 of 15.01.2024.

At the meeting of the Academic Quality Commission of the Research School of Physical and Chemical Sciences
Recommended for approval by the Academic Council of the University
Protocol № 1 from «06» June 2024

Approved

at a meeting of the University Academic Council by protocol No. 6/1 of January 19, 2024.

at a meeting of the University Academic Council by protocol No. 11 of June 28, 2024.

Content

1.Introduction

1.1.General data

The Department of «Technical Physics and heat power engineering» of the research school of physical and chemical sciences of the Non-profit joint-stock company Shakarim State University of Semey, provides training for the educational program «6B07103 Heat Power Engineering». During the implementation of the educational program, specialists are trained in the field of research, design, design and operation of technical means for the production of heat, its application, control of its flows and the conversion of other types of energy into heat, realizing these processes. The training of bachelors in this direction is carried out in close cooperation with the SCS «Teplokommunenergo» in Semey, on the basis of which a branch of the department was opened. All types of practices are carried out on the basis of the branch. This approach in the educational process makes it possible to prepare future specialists in the field of heat and power engineering, taking into account the requirements of the future employer.

The educational program provides for the education of a student with special educational needs in the conditions of a higher educational institution, as well as his socialization and integration into society.

When implementing the educational program, it is planned to use artificial intelligence tools in the educational process, thereby developing digital competencies among students in a rapidly changing technological environment.

The educational program provides for the education of a student with special educational needs in the conditions of a higher educational institution, as well as his socialization and integration into society.

1.2.Completion criteria

The main criterion for the completion of the educational process for the preparation of bachelors is the development by students of at least 205 credits of theoretical training, as well as at least 27 credits of practice, 8 credits of final certification. Total 240 credits.

1.3.Typical study duration: 4 years

2.PASSPORT OF THE EDUCATIONAL PROGRAM

2.1.EP purpose	The training of graduates with extensive knowledge, whose activities include research, design, construction and operation of technical means for the production of heat, its application, management of its flow and the conversion of other types of energy into heat, implementing these processes.
2.2.Map of the training profile within the educational program	
Code and classification of the field of education	6B07 - Engineering, manufacturing and construction industries
Code and classification of the direction of training	6B071 - Engineering and Engineering affairs
Code in the International Standard Classification of Education	0710
Code and classification of the educational program group	B062 - Electrical engineering and power engineering
Code and name of the educational program	6B07103 - Heat Power Engineering
2.3.Distinctive features of the OP (double degree/joint, OVPO-partner, Double major, innovative)	-
2.4.Qualification characteristics of the graduate	
Degree awarded / qualification	Bachelor of Engineering and Technology under the educational program «6B07103 - Heat power engineering»
Name of professional standard	Operation and repair of fuel supply Operation and repair of boiler-turbine equipment
Atlas of new professions	-
Regional standard	-
Name of the profession / list of positions of a specialist	Can occupy primary positions: laboratory engineer, engineer of research, design and design organizations without presenting requirements for the work experience of a category 1 technician and other positions without presenting requirements for work experience in accordance with qualification requirements
OQF qualification level (industry qualification framework)	6
Area of professional activity	Industry, energy industry, education, science
Object of professional activity	Enterprises and firms of energy and technological profiles in the field of energy supply of industrial enterprises. Research institutions. Higher and secondary specialized educational institutions.
Types of professional activity	Design and engineering Production and technological Research Installation and commissioning Organizational and managerial
2.5.Graduate Model	Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society. Apply methods for calculating and selecting equipment for energy systems, ventilation and air

	conditioning systems based on the latest achievements of science and technology Apply basic knowledge in the feld of mathematics and natural sciences, methods of mathematical analysis and modeling, theoretical and experimental research in the feld of energy in cognitive and professional activities. To apply in educational, scientifc and professional activities the requirements for the graduate of the educational program of the rules, requirements and norms for the preparation of documentation. Use the fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology. Operate knowledge in the feld of electrical engineering, measuring instruments, automation and information technology in their subject area Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the feld of energy Describe the principles of operation and conduct of heat engineering calculations of developed and used heat power and heat technology installations and systems. Perform calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the terms of reference. Calculate and regulate energy production and distribution systems.

3.Modules and content of the educational program

Module 1. Fundamentals of social and humanitarian knowledge

Brief description of the module content

This module reveals such aspects as: socio-cultural, economic-legal, environmental knowledge, communication skills, the use of information technology taking into account modern trends in the development of society.

Module disciplines
Foreign language

Kazakh(Russian) language (1)

Bases of economics, law and ecological knowledge

Physical Culture

Foreign language

History of Kazakhstan

Kazakh(Russian) language (2)

The module of socio-political knowledge (sociology, political science, cultural studies, psychology)

Physical Culture

Physical Culture

World of Abai

Information and communication technology

Physical Culture

Philosophy

Module 2. Natural sciences

Brief description of the module content

The module is aimed at the formation of logical thinking, development of mathematical culture and preparation for the study of disciplines forming professional competencies.

Module disciplines
Mathematics

Physics

Chemistry

Module 3. Requirements and norms for the design of engineering documentation in educational, scientific and professional activities

Brief description of the module content

The module focuses on the study of the rules and standards governing the design of engineering documentation.

Module disciplines
Introduction to the specialty

The history of the development of thermal power engineering

Fundamentals of thermal power engineering

Application of USDD standards in the design of engineering documentation.

Educational practice

Module 4. Fundamental laws of mechanics, thermodynamics and heat and mass transfer

Brief description of the module content

The module includes the study of the basic principles and laws underlying mechanics, thermodynamics and heat and mass transfer.

Module disciplines
Theoretical and applied mechanics

Theoretical basics of heat engineering

Heat engineering

Thermodynamics and heat transfer

Heat and mass transfer

Technical thermodynamics

Fluid and gas mechanics

Heat and mass transfer processes and apparatuses thermotehnologi

Heat and mass transfer in power plants

Thermal energy systems and energy use

Thermodynamic fundamentals cycles of thermal power plants

Theoretical foundations of refrigeration technology

Refrigeration technology

Refrigeration machines

Module 5. Automation and Information technology

Brief description of the module content

The module includes the study of modern methods and technologies of automation of production processes and the use of information technology in engineering activities.

Module disciplines

Computer technologies in thermal power engineering

Theoretical foundations of electrical engineering

Electrical engineering and electronics

Electrical engineering, electronics and electric drive

Elements of machine graphics and CAD basics in thermal power engineering

Automation of turbine plants

Automation of the power equipment of thermal and nuclear power plants

Dosimetric instruments

Means of accounting and control in the thermal power industry

Technical instruments and measurements in thermal power engineering

Module 6. Innovative technologies of engineering and heat technologies

Brief description of the module content

The module aims to explore current innovative approaches in the field of thermal technology.

Module disciplines

High temperature materials and coverings

Air conditioning and refrigeration

Design of turbine plants

Heat pumps

Energy saving in industrial enterprises

Basics of nature

Modern methods of energy conversion (in english)

Modern methods of energy conversion (in russian)

Energy in Kazakhstan

Energy saving in heat power engineering and heat technology

Alternative and renewable energy sources

Basics of alternative energy

Theoretical Foundations of spectrometry

Module 7. Fundamentals of calculations of heat power and heat technology installations and systems

Brief description of the module content

The module is a comprehensive study of the basic principles of operation, design and operation of heat power and heat process plants.

Module disciplines
Manufacturing practice I

Special questions fuel combustion

Gas turbines and GTP

Boiler installations and steam generators

Installation and operation of heat and power equipment

Power boilers and low-capacity boiler plants

Physico-chemical methods of water preparation

Water conditioning

Waste water treatment technology

Module 8. Typical calculation and design methods

Brief description of the module content

The module covers the study of calculation and design methods for various types of power equipment.

Module disciplines
Steam turbines

The turbines of thermal and nuclear power stations

Manufacturing practice II

Hydraulic machine

Compressors, fans and pumps

Superchargers and heat engines

Thermal mechanical and auxiliary equipment of power plants

Technological energy resources of enterprises

Refrigeration units

Design and research activity

Module 9. Energy production and distribution systems

Brief description of the module content

The module deals with the peculiarities of heat and mass transfer processes of various types of power plants and heat supply systems.

Module disciplines
Industrial heat and mass transfer processes and installation

Thermal and nuclear power stations

Energye equipment NPI

Principles of NPP safety assurance

The thermal network

Operation and technical service of turbine equipment

TPP operation and safety precautions

Energy life support systems and safety

Module 10. Efficiency of energy systems and their feasibility study

Brief description of the module content

The module includes the study of the main aspects of enterprise resource management, improving their efficiency and profitability, as well as analyzing the main technical and economic indicators of functioning.

Module disciplines
Economics of enterprise

Undergraduate practice

Manufacturing practice III

Final examination

Brief description of the module content

Writing and defending a graduation project or preparing and passing a comprehensive exam.

Module disciplines

Diploma project

Comprehensive exam

4.Summary table on the scope of the educational program

«6B07103 - Heat Power Engineering»

Name of discipline	Cycle/ Component	Term	Number of credits	Total hours	Lec	SPL	LC	IWST	IWS	Knowledge control form
Module 1. Fundamentals of social and humanitarian knowledge										
Foreign language	GER/CC	1	5	150		45		35	70	Examination
Kazakh(Russian) language (1)	GER/CC	1	5	150		45		35	70	Examination
Bases of economics, law and ecological knowledge	GER/US	1	5	150	15	30		35	70	Examination
Physical Culture	GER/CC	1	2	60		60				Differentiated attestation
Foreign language	GER/CC	2	5	150		45		35	70	Examination
History of Kazakhstan	GER/CC	2	5	150	30	15		35	70	Qualification examination
Kazakh(Russian) language (2)	GER/CC	2	5	150		45		35	70	Examination
The module of socio-political knowledge (sociology, political science, cultural studies, psychology)	GER/CC	2	8	240	30	45		55	110	Examination
Physical Culture	GER/CC	2	2	60		60				Differentiated attestation
Physical Culture	GER/CC	3	2	60		60				Differentiated attestation
World of Abai	BS/US	3	3	90	15	15		20	40	Examination
Information and communication technology	GER/CC	4	5	150	15	15	15	35	70	Examination
Physical Culture	GER/CC	4	2	60		60				Differentiated attestation
Philosophy	GER/CC	5	5	150	15	30		35	70	Examination
Module 2. Natural sciences										
Mathematics	BS/US	1	5	150	15	30		35	70	Examination
Physics	BS/US	1	3	90	15	15		20	40	Examination
Chemistry	BS/US	3	5	150	15	15	15	35	70	Examination
Module 3. Requirements and norms for the design of engineering documentation in educational, scientific and professional activities										
Introduction to the specialty	BS/CCh	1	3	90	15	15		20	40	Examination
The history of the development of thermal power engineering	BS/CCh	1	3	90	15	15		20	40	Examination
Fundamentals of thermal power engineering	BS/CCh	1	3	90	15	15		20	40	Examination
Application of USDD standards in the design of engineering documentation.	BS/US	2	5	150	15	30		35	70	Examination
Educational practice	BS/US	2	2	60						Total mark on practice
Module 4. Fundamental laws of mechanics, thermodynamics and heat and mass transfer										

Theoretical and applied mechanics	BS/US	3	3	90	15	15		20	40	Examination
Theoretical basics of heat engineering	BS/CCh	3	5	150	15	15	15	35	70	Examination
Heat engineering	BS/CCh	3	5	150	15	30		35	70	Examination
Thermodynamics and heat transfer	BS/CCh	3	5	150	15	30		35	70	Examination
Heat and mass transfer	BS/CCh	4	5	150	15	30		35	70	Examination
Technical thermodynamics	BS/CCh	4	5	150	30	15		35	70	Examination
Fluid and gas mechanics	BS/US	4	5	150	15	30		35	70	Examination
Heat and mass transfer processes and apparatuses thermotehnologi	BS/CCh	4	5	150	15	30		35	70	Examination
Heat and mass transfer in power plants	BS/CCh	4	5	150	15	30		35	70	Examination
Thermal energy systems and energy use	BS/CCh	4	5	150	30	15		35	70	Examination
Thermodynamic fundamentals cycles of thermal power plants	BS/CCh	4	5	150	30	15		35	70	Examination
Theoretical foundations of refrigeration technology	BS/CCh	5	5	150	15	30		35	70	Examination
Refrigeration technology	BS/CCh	5	5	150	15	30		35	70	Examination
Refrigeration machines	BS/CCh	5	5	150	15	30		35	70	Examination
Module 5. Automation and Information technology										
Computer technologies in thermal power engineering	BS/CCh	3	5	150	15	15	15	35	70	Examination
Theoretical foundations of electrical engineering	BS/CCh	3	5	150	15	15	15	35	70	Examination
Electrical engineering and electronics	BS/CCh	3	5	150	15	15	15	35	70	Examination
Electrical engineering, electronics and electric drive	BS/CCh	3	5	150	15	15	15	35	70	Examination
Elements of machine graphics and CAD basics in thermal power engineering	BS/CCh	3	5	150	15	15	15	35	70	Examination
Automation of turbine plants	BS/CCh	6	5	150	15	30		35	70	Examination
Automation of the power equipment of thermal and nuclear power plants	BS/CCh	6	5	150	15	30		35	70	Examination
Dosimetric instruments	BS/CCh	6	5	150	15	15	15	35	70	Examination
Means of accounting and control in the thermal power industry	BS/CCh	6	5	150	15	15	15	35	70	Examination
Technical instruments and measurements in thermal power engineering	BS/CCh	6	5	150	15	15	15	35	70	Examination
Module 6. Innovative technologies of engineering and heat technologies										
High temperature materials and coverings	BS/CCh	5	5	150	30	15		35	70	Examination
Air conditioning and refrigeration	BS/CCh	5	5	150	30	15		35	70	Examination
Design of turbine plants	BS/CCh	6	5	150	15	15	15	35	70	Examination
Heat pumps	BS/CCh	6	5	150	15	15	15	35	70	Examination
Energy saving in industrial enterprises	BS/CCh	7	5	150	30	15		35	70	Examination
Basics of nature	BS/CCh	7	5	150	30	15		35	70	Examination
Modern methods of energy conversion (in english)	BS/CCh	7	5	150	15	30		35	70	Examination

Modern methods of energy conversion (in russian)	BS/CCh	7	5	150	15	30		35	70	Examination
Energy in Kazakhstan	BS/CCh	7	5	150	15	30		35	70	Examination
Energy saving in heat power engineering and heat technology	BS/CCh	7	5	150	30	15		35	70	Examination
Alternative and renewable energy sources	AS/CCh	7	5	150	15	30		35	70	Examination
Basics of alternative energy	AS/CCh	7	5	150	15	30		35	70	Examination
Theoretical Foundations of spectrometry	AS/CCh	7	5	150	15	30		35	70	Examination
Module 7. Fundamentals of calculations of heat power and heat technology installations and systems										
Manufacturing practice I	BS/US	4	5	150						Total mark on practice
Special questions fuel combustion	AS/CCh	4	5	150	15	30		35	70	Examination
Gas turbines and GTP	AS/CCh	4	5	150	15	30		35	70	Examination
Boiler installations and steam generators	AS/CCh	5	5	150	15	15	15	35	70	Examination and term work/Project
Installation and operation of heat and power equipment	AS/CCh	5	5	150	15	30		35	70	Examination and term work/Project
Power boilers and low-capacity boiler plants	AS/CCh	5	5	150	15	30		35	70	Examination and term work/Project
Physico-chemical methods of water preparation	AS/CCh	6	5	150	15	15	15	35	70	Examination
Water conditioning	AS/CCh	6	5	150	15	15	15	35	70	Examination
Waste water treatment technology	AS/CCh	6	5	150	15	15	15	35	70	Examination
Module 8. Typical calculation and design methods										
Steam turbines	AS/CCh	5	5	150	15	30		35	70	Examination and term work/Project
The turbines of thermal and nuclear power stations	AS/CCh	5	5	150	15	30		35	70	Examination and term work/Project
Manufacturing practice II	BS/US	6	5	150						Total mark on practice
Hydraulic machine	AS/CCh	6	5	150	30	15		35	70	Examination
Compressors, fans and pumps	AS/CCh	6	5	150	30	15		35	70	Examination
Superchargers and heat engines	AS/CCh	6	5	150	30	15		35	70	Examination
Thermal mechanical and auxiliary equipment of power plants	BS/CCh	7	5	150	30	15		35	70	Examination
Technological energy resources of enterprises	BS/CCh	7	5	150	30	15		35	70	Examination
Refrigeration units	BS/CCh	7	5	150	30	15		35	70	Examination
Design and research activity	AS/US	7	3	90	15	15		20	40	Examination
Module 9. Energy production and distribution systems										
Industrial heat and mass transfer processes and installation	AS/CCh	5	5	150	15	30		35	70	Examination and term work/Project
Thermal and nuclear power stations	AS/CCh	5	5	150	15	30		35	70	Examination and term

										work/Project
Energye equipment NPI	AS/CCh	5	5	150	15	30		35	70	Examination and term work/Project
Principles of NPP safety assurance	AS/CCh	7	6	180	30	30		40	80	Examination
The thermal network	AS/CCh	7	5	150	15	30		35	70	Examination and term work/Project
Operation and technical service of turbine equipment	AS/CCh	7	5	150	15	30		35	70	Examination and term work/Project
TPP operation and safety precautions	AS/CCh	7	6	180	30	30		40	80	Examination
Energy life support systems and safety	AS/CCh	7	6	180	30	30		40	80	Examination
Module 10. Efficiency of energy systems and their feasibility study										
Economics of enterprise	BS/US	7	3	90	15	15		20	40	Examination
Undergraduate practice	AS/CCh	8	15	450						Total mark on practice
Manufacturing practice III	AS/CCh	8	15	450						Total mark on practice
Final examination										
Diploma project		8	8	240						
Comprehensive exam		8	8	240						

NON -PROFIT LIMITED COMPANY «SHAKARIM UNIVERSITY OF SEMEY

DEVELOPMENT PLAN FOR THE EDUCATIONAL PROGRAMME

6B07103 – «Heat Power Engineering»

for the years 2024-2028

Semey 2024

Content

1. Passport of the Development Plan of the Bachelor's/Master's Program 6B07103 – «Heat Power Engineering»

1	Basis for development	Development Program of Non-commercial joint-stock company «Shakarim university of Semey» for 2023-2029. School work plan
2	Implementation timeframe	2024-2028
3	Expected results of realization	Demonstrate socio-cultural, economic-legal, ecological knowledge and communicative skills, Apply information technologies taking into account modern trends in the development of society. Apply methods of calculation and selection of equipment of energy systems, ventilation and air conditioning systems on the basis of the latest achievements of science and technology. To apply in cognitive and professional activity basic knowledge in the field of mathematics and natural sciences, methods of mathematical analysis and modeling, theoretical and experimental research in the field of energy. To apply in educational, scientific and professional activity the requirements to the graduate of the educational program. rules, requirements and norms of documentation execution. To use fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology. To operate knowledge in the field of electrical engineering, measuring instruments, automation and information technologies in his/her subject area. Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the field of energy. Describe the principles of operation and conduct thermal engineering calculations of developed and used heat power and heat engineering plants and systems.

		Carry out calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the technical assignment. Calculate and regulate energy production and distribution systems.

2. Analytical substantiation of the educational program

2.1 Information about the educational program

The educational program is designed in accordance with the National Qualifications Framework and professional standards, according to the Dublin Descriptors and the European Qualifications Framework. The typical duration of the Bachelor's degree program is 4 years.

The main criterion for the completion of the educational process is the mastering of at least 240 credits, with the awarding of the Bachelor of Engineering and Technology degree in the educational program 6B07103 – «Heat Power Engineering».

2.2 Internal and external conditions of the educational program development

Academic year / Basis of learning	2024-2025 academic year	2025-2026 academic year	2026-2027 academic year	2027-2028 academic year
Grant	20	20	20	20
Contract	5	5	5	5
Total	25	25	25	25

2.3 Internal and external conditions of the educational program development

The chair has modern classrooms and laboratories, technical means of teaching, visual and demonstration materials.

To conduct classes the chair has an auditorium fund (9 building):

108 - laboratory "Heat and cold technologies";

113 - laboratory of energy systems;

202 - computer class;

203 - thematic auditorium on the basics of power engineering;

209 - laboratory of thermal-humidity and low-temperature installations;

214 - laboratory of virtual power engineering;

216 - lecture room.

The laboratories are equipped with the necessary equipment.

Sanitary condition of classrooms and laboratories meet the normative requirements.

There is free access to the Internet.

There is a student scientific circle.

The Memorandum of Cooperation with the State Enterprise «Teplokommunenergo Semey» and the agreement on dual training with the State Enterprise «Teplokommunenergo Semey». There is a branch of the department on the basis of the State Enterprise «Teplokommunenergo Semey». At the enterprise there are classes on dual system of training, also pass all kinds of practice. Leading specialists of the State Enterprise «Teplokommunenergo» participate in the development of the educational program, conducting classes and guiding practice, which contributes to better adaptation of students in the workplace.

In 2023, the educational program passed international accreditation for the implementation of dual training.

The department carries out work on funded projects:

AP13068365 Development of resource-saving method of surface hardening of working bodies of soil tillage machines (74221878 tng.);

AP13068529 Development of technology of electron-beam modification of polymeric materials used in mechanical engineering (73941056 tng.);

AP13068451 Preparation of multifunctional calcium-phosphate coatings with titanium dioxide nanoparticles by plasma-electrolytic oxidation (74405400 tng.);

AP14871373 Development of supersonic arc metallization technology for restoration of worn surfaces of crankshafts of internal combustion engines (76840457 tng.);

AP23489446 Improving the efficiency of hybrid solar collectors using nanomodified phase transition materials (79,005,621 tng.).

2.4 Information about the teaching staff implementing the educational program

№	Indicators	Unit	2024-2025 academic year	2025-2026 academic year	2026-2027 academic year	2027-2028 academic year
1	Share of teaching staff with academic degrees in EP	%	**55**	**55**	**55**	**55**
2	Including the share of faculty members with a degree in general education disciplines cycle	%	**40**	**40**	**40**	**40**

The department employs full-time and part-time teachers (production workers). Teachers of the department regularly improve their qualification:

Stepanova O.A., Candidate of Technical Sciences, Associate Professor - Renewable energy sources: resources and technologies (72 hours) Non-commercial joint-stock company «Toraigyrov University» (18.04.2022 - 29.04.2022). Republic of Kazakhstan. Nur-Sultan, Pavlodar; Educational Leadership Course (80 hours) Higher School of Education Nazarbayev

University. (28.02.2022 - 20.04.2022). Republic of Kazakhstan. Semey; Radiation protection and safety (72 hours) KAZSEMPROM LLP, Semey. (01.09.2021 - 19.11.2021). Republic of Kazakhstan. Semey; Measurement of thermophysical properties of substances (72 hours) East Kazakhstan State University named after Sarsen Amanzholov. (07.10.2019 - 25.10.2019). Republic of Kazakhstan. Ust-Kamenogorsk; Renewable Energy Technology Fundamentals, Coursera (05.10.2022 - 05.11.2022); Introduction to Thermodynamics: Transferring Energy from Here to There, Coursera (05.10.2022 - 04.11.2022);

Ermolenko M.V., Candidate of Technical Sciences. - Renewable Energy Sources: Resources and Technologies (72 hours) Non-commercial joint-stock company «Toraigyrov University». (18.04.2022 - 29.04.2022). Republic of Kazakhstan. Nur-Sultan, Pavlodar; Radiation protection and safety (72 hours) KAZSEMPROM LLP, Semey. (01.09.2021 - 19.11.2021). Republic of Kazakhstan. Semey; Measurement of thermophysical properties of substances (72 hours) Sarsen Amanzholov East Kazakhstan State University. (07.10.2019 - 25.10.2019). Republic of Kazakhstan. Ust-Kamenogorsk; Management in education. Development of author's programs, ULLTYQ USTAZ. Astana (21.08.2023 - 01.09.2023);

Kassymov A.B., PhD - Radiation Protection and Safety (72 hours) KAZSEMPROM LLP. (01.09.2021 - 19.11.2021). Kazakhstan. Semey; Operator of information technology TGID-07 for development of operational prospective thermal-hydraulic regimes of centralized heat supply systems (36 hours) PKF «Sirius». (05.04.2021 - 10.04.2021). Kazakhstan. Karaganda; Measurement of thermophysical properties of substances (72 hours) Sarsen Amanzholov East Kazakhstan State University. (07.10.2019 - 25.10.2019). Kazakhstan. Ust-Kamenogorsk;

Khazhidinova A.R., PhD - Active methods of training as a condition for the development of professional competence of university teachers (40 hours) JSC National Center for Advanced Qualification «Orleu». (22.08.2022 - 26.08.2022). Kazakhstan. Semey; Renewable energy sources: resources and technologies (72 hours) Non-commercial joint-stock company «Toraigyrov University». (18.04.2022 - 29.04.2022). Republic of Kazakhstan. Nur-Sultan, Pavlodar; Within the framework of the «Perfect Future» project, a training webinar for the improvement of educational work based on the principles of «Spiritual Revival» among teachers of higher educational institutions (128 hours) Kazakhstan Institute of Social Development «Spiritual Revival». (22.09.2021 - 30.11.2021). Kazakhstan. Nur-Sultan; Radiation protection and safety (72 hours) «KAZSEMPROM» LLP. (01.09.2021 - 19.11.2021). Kazakhstan. Semey; Digital technologies in the educational process of distance learning (72 hours) Non-commercial joint-stock company «Shakarim University of Semey» . (22.02.2021 - 10.03.2021). Kazakhstan. Semey;

Aldazhumanov J.K., Master - Radiation Protection and Safety (72 hours) KAZSEMPROM LLP. (01.09.2021 - 19.11.2021). Kazakhstan. Semey; Digital technologies in the educational process of distance learning (72 hours) Shakarim University of Semey. (07.07.2020 - 18.07.2020). Kazakhstan. Semey; Non-destructive testing technologies (72 hours) Sarsen Amanzholov East Kazakhstan State University. (07.10.2019 - 25.10.2019). Ust-Kamenogorsk; Management in education. Development of author's programs, ULLTYQ USTAZ. Astana (21.08.2023 - 01.09.2023);

Satybaldinova A.E., Master – «Active teaching methods as a condition for the development of professional competencies of university teachers» (40 hours) JSC «National Center for Advanced Training «Orleu». (08/22/2022 - 08/26/2022). Kazakhstan. Families; Reactor technologies (36 hours) RSE NNC RK. (11/16/2021 - 11/18/2021). Kazakhstan. Kurchatov; Radiation protection and safety (72 hours) KazSemProm LLP. (09/01/2021 - 11/19/2021). Kazakhstan. Families; How to write a literature review with Scopus. Non-commercial joint-stock company «Shakarim University of Semey». (03.10.2023 - 06.10.2023); “Mamandygym – bolashagym” zhobasy. NJSC Shakarim University of Semey (11/20/2023 - 11/24/2023); «The effectiveness of using Action Research, Lesson Study, Learning study in pedagogy» NJSC «Shakarim University of Semey» (01/15/2024 - 01/19/2024);

Nurgaliyev D.N., Master - Radiation Protection and Safety (128 hours) of the Ministry of Education and Science of the Russian Federation. (24.09.2021 - 30.11.2021). Kazakhstan. Nur-Sultan; Radiation Protection and Safety (72 hours) KazSemprom LLP. (01.09.2021 - 19.11.2021). Kazakhstan. Semey; Digital Technologies in the Educational Process of Distance Learning (72 hours) NJSC Shakarim Semey University. (22.02.2021 - 10.03.2021). Kazakhstan. Semey; Special training of personnel responsible for nuclear and radiation safety (54 hours) Meruert and Company Center LLP. (02.10.2019 - 07.10.2019). Kazakhstan. Shymkent; Low-potential energy (36 hours) Novosibirsk State Technical University (NSTU). (20.05.2019 - 18.06.2019). Russia. Novosibirsk; The main transformation: teacher, teacher, moderator. The project aims to increase the number of art and cultural heritage sites. (15.01.2024 - 19.01.2024);

Umyrzhan T.N., Master's Degree - Educational Leadership Course (80 hours). (28.02.2022 - 20.04.2022). Kazakhstan. Nur-Sultan; Reactor Technologies (36 hours) NNC RK. (16.11.2021 - 18.11.2021). Kazakhstan. Kurchatov;

Zarykbayeva K. S., Master - Measurement of thermophysical properties of substances (72 hours). East Kazakhstan State University named after Sarsen Amanzholov. (07.10.2019 - 25.10.2019); Digital technologies in the educational process of distance learning. Shakarim University. (07.07.2020 - 18.07.2020);

Leonidova A.B., Master - Measurement of thermophysical properties of substances. East Kazakhstan State University named after Sarsen Amanzholov. Ust-Kamenogorsk. (07.10.2019 - 25.10.2019); Digital technologies in the educational process of distance learning. Semey kalasynyn shakərim atyndagy universiteti innovatylyқ bilim take tekhnologilar ortalygy. (07.07.2020 - 18.07.2020); Renewable energy sources; resources and technologies. Toraigyrov University. Pavlodar. (04/18/2022 - 04/29/2022); Effectiveness of application in pedagogy of Action Research, Lesson Study, Learning Study. Non-commercial joint-stock company «Shakarim University of Semey». (01/15/2024 - 01/19/2024).

The faculty of the department has publications in journals from the list of editions recommended by the Committee for Quality Assurance in Science and Higher Education of the Ministry of Science and Higher Education of the Republic of Kazakhstan, in the databases WebofScience and Scopus, in the materials of International conferences.

At the department two teachers received the title of the best teacher of the university (Kassymov A.B. - 2021, Stepanova O.A. - 2022.).

2.5 Characteristics of the educational program achievement

Students of the educational program are winners and prize-winners of the Republican subject Olympiads on heat power engineering and Republican competitions in research and development and international competitions since 2010 (OP was opened in 2005):

2010 - 1st place Republican NIRS competition;

2011 - 1st place in team, 1st and 2nd place in individual championship Republican Subject Olympiad;

2011 - 1st and 3rd place Republican Research and Development Contest;

2011 - 2nd place All-Russian youth scientific conference with international participation "Modern problems of fundamental and applied sciences" (Kemerovo, full-time participation);

2012 - 2nd place team Republican Subject Olympiad;

2012 - 2nd place and three 3rd places Republican competition of research and development;

2012 - 2nd and 3rd place International Student Scientific and Technical Seminar among students of higher educational institutions (Tomsk Polytechnic University, full-time participation);

2012 - 1st place Republican competition of projects among students, graduate students, young scientists on promotion of renewable energy sources and energy efficient lighting in Kazakhstan, conducted by Chevron, Almaty University of Energy and Communications, UN Development Program and RESD public foundation;

2012 - 2nd place Innovation convention "Kuzbass: Education, Science, Innovation";

2013 - 3rd place team Republican Subject Olympiad;

2013 - 3rd place Republican Research and Development Competition;

2013 - 2nd and two 3rd places Republican competition of projects among students, graduate students, young scientists on promotion of renewable energy sources and energy efficient lighting in Kazakhstan, held by Chevron, Almaty University of Energy and Communications, UN Development Program and RESD Public Foundation;

2013 - 3rd place Innovation convention "Kuzbass: education, science, innovation";

2014 - 2nd place team Republican Subject Olympiad;

2014 - 1st and 3rd place Republican Research and Development Contest;

2015 - 1, 2, 3 places Republican Research and Development Contest;

2016 - two 3rd places in individual competition Republican Subject Olympiad;

2016 - 2nd place Republican Research and Development Contest;

2017 - 3rd place team and 2nd place in individual championship Republican Subject Olympiad;

2017 - 2nd and 3rd place Republican Research and Development Contest;

2018 - 2nd and 3rd place Republican NIRS competition;

2019 - 1st place team, 1st and 3rd place in individual championship Republican Subject Olympiad;

2019 - 3rd place Republican Research and Development Contest;

2020 - 4th place (credit) Republican Olympiad on physical and mathematical disciplines among future power engineers (AUES named after Gumarbek Daukeev" jointly with JSC "Samruk-Energo", Almaty);

2021 - 2nd place Republican Research and Development Competition;

2021 - 1 and 2 Republican Olympiad on physical and mathematical disciplines among future power engineers (AUES named after Gumarbek Daukeev" jointly with "Samruk-Energo" JSC, Almaty);

2022 - 1st place team, 1st and 2nd place in individual championship Republican subject Olympiad;

2022 - 2nd place Republican Research and Development Contest.

2019, 2020, 2022 Umyrzhan T., Martynova N., Manulenko A. became winners of the Republican competition for a scholarship of the Fund of the first President of the Republic of Kazakhstan.

2023 students Kasemkanov D., Toktar J., Orazgulov D. became prizewinners (2nd place) in the Republican competition of NIRS, students Manulenko A. and Aitkazin B. took 3rd place in the Republican competition of NIRS.

2024 student Skakova R. took the 1st place in the individual championship in the Republican subject Olympiad in Heat Power Engineering, Skakova R. and Aitkazin B. took the 2nd team place in the Republican subject Olympiad in Heat Power Engineering, students Kasemkanov D., Aitkazin B., Skakova R. took the 1st place in the Republican competition of NIRS.

The educational program as a pilot program has passed international accreditation within the framework of the International Project Erasmus KazDual on the development of dual system of education.

3 Main objectives of the educational program development plan

The development plan is aimed at fulfilling the goal of the educational program, which was formulated taking into account the requirements of the modern labor market. The aim of the educational program: training of graduates with extensive knowledge, whose field of activity includes research, design, construction and operation of technical means for heat production, its application, control of its flows and conversion of other types of energy into heat, implementing these processes.

Specialists are trained in the field of research, design, construction and operation of technical means for heat production, its application, control of its flows and conversion of other types of energy into heat, realizing these processes. Training of bachelors under this program is carried out in close cooperation with the State Enterprise "Teplokommunenergo" of Semey city. This approach in the educational process allows to prepare future specialists in the field of heat power engineering taking into account the requirements of the future employer.

The main objectives of the EP development are given in Table 1.

Table 1 - Objectives of the educational program development

№	Objectives of the educational program development plan	Activities to accomplish the task
1	Training of personnel in the field of energy taking into account the demands of the internal and external labor market.	planning the work of the department taking into account the criteria of quality assessment and risk assessment in personnel training
2	Working with potential employers to develop and assess the learning outcomes of graduates of the educational program	joint development and implementation of the educational program with employers;
3	Development of scientific potential of the educational program	further development and improvement of dual training

4. Risk analysis of the educational program

№	Name of risks	Elimination measures
1	Decrease in the contingent of students under the EP	Conducting propaganda and explanatory work with applicants for the program «Heat Power Engineering».
2	Insufficient level of language knowledge for implementation of trilingual education	Conducting foreign language courses.
3	Decrease in the level of employment	Involvement of employers, graduation fair
4	Insufficient development of external and internal academic mobility of students and teaching staff.	Selection of universities for academic mobility and conclusion of contracts.
5	Risk of decrease in the number of faculty members on the EPs	Stimulation of teaching staff to obtain and improve academic degrees.

5. Action plan for the development of the educational program

№	Criteria	Expected results	Unit	2024-2025		2025-2026		2026-2027		2027-2028	
				Plan	Actual implementation	Plan	Actual implementation	Plan	Actual implementation	Plan	Actual implementation
Orientation 1. Educational and methodological support											
1.1	Updating the educational program on the basis of professional standards taking into account employers' recommendations	Examination of the Educational Program 6B07103 – «Heat Power Engineering» in order to increase the practice-orientedness and development of professional competencies of graduates	fact.	-		+		-		+	
1.2	Monitoring and updating catalogs of elective disciplines in accordance with the development of key and professional competencies, labor market demands	Improving the quality of the content of educational programs by including elective courses aimed at developing key and professional competencies of graduates in accordance with labor market demands.	fact.	-		+		-		-	
1.3	Introduction into the educational process of modern teaching technologies that contribute to the development of cognitive activity and communicative ability of students	Improving the quality of teaching academic disciplines, taking into account the novelty and variety of forms of work that contribute to the development of cognitive activity.	fact.	+		+		+		+	

1.3.1	Introduction into the educational process of massive open online courses (MOOCs) according to the educational program 6B07103 – «Heat Power Engineering»	Introduction of disciplines into the educational process Improving the quality of teaching academic disciplines, taking into account the novelty and variety of forms of work that contribute to the development of cognitive activity.	unit.	-		-		-		1	
1.4	Involving social partners and employers in the development and examination of the implementation of educational programs	Improving the quality of implemented educational programs taking into account market demands and employer recommendations	unit.	2		2		2		2	
1.5	Development and implementation of elective courses in English	Introduction of disciplines in English into the educational process	unit.	-		-		-		1	
1.6	Conducting seminars and round tables on the use of innovative technologies in the educational process	Introduction of innovative technologies into the educational process	unit.	-		1		1		1	
1.7	Publication of educational, educational, methodological and scientific literature on implemented educational programs	Improving educational and methodological support in the disciplines of implemented educational programs	unit.	-		1		1		1	
1.8	Concluding agreements with foreign and domestic partner universities in order to develop academic exchange of students of all levels and teaching staff	Creation of a base of foreign and domestic universities - partners for the development of academic exchange of students of all levels and teaching staff	unit.	-		-		-		1	
1.9	Inviting students from partner universities to study for a semester, short-term internships, practice, etc.	Development of international recognition of educational programs, implementation of academic mobility programs for students	people.	-		-		-		1	

1.10	Participation of teaching staff and students in international academic exchange programs	Development of international cooperation with foreign universities implementing educational programs in energy	people.	-		-		-		1	
1.11	Development of outgoing academic mobility of teaching staff and students in the field of energy	Improving the educational program based on the experience of implementing similar programs in leading foreign universities	people.	-		-		-		1	
Orientation 2. Teaching staff											
2.1	Increasing the professional level and training of scientific and pedagogical personnel for the implementation of educational programs once every 5 years	The share of teaching staff who have undergone advanced training at the republican and international level is at least 20%	people.	2		2		2		2	
2.2	Completion of advanced training, retraining, internship of teaching staff at the international level	Completion of at least 2 teachers in advanced training, retraining, and internship programs for teaching staff at the international level	people.	2		2		2		2	
2.3	Promotion of publications of teaching staff works in international publications indexed by the Web of Science and Scopus databases	Increasing the share of teaching staff who have published the results of scientific research in publications indexed by the Web of Science and Scopus databases - at least 30% of the total number of teaching staff	%	30		30		30		30	
2.4	Involvement of practical specialists in teaching and scientific activities	Participation in the implementation of educational programs of practitioners (at least 20% of specialists)	%	20		20		20		20	
Orientation 3. Internationalization of educational programs											

3.1	Concluding agreements on international cooperation with foreign universities	Implementation of joint projects, preparation of scientific publications with foreign partners, creation of bases for scientific internships for students	unit.	-		-		-		1	
3.2	Attracting foreign students to study under the educational program 6B07103 – «Heat Power Engineering»	Increase in the number of foreign students	people.	-		-		-		1	
3.3	Organization of joint scientific and practical activities with international partners	Improving the efficiency of scientific and scientific-methodological activities of teaching staff, exchange of experience with foreign partners	unit.	-		1		1		1	
3.4	Expansion of cooperation with advanced foreign scientific and educational organizations in order to attract the most qualified foreign specialists to the implementation of educational programs	Formation of key and professional competencies in accordance with the practice of leading universities	people.	-		-		-		1	
Orientation 4: Logistics and digitalization											
4.1	Step-by-step equipping of classrooms with technical means of education (projectors, panels, interactive and multimedia boards, multifunctional devices, webcam, projector screen, etc.).	Equipping the classrooms assigned to the department with technical means of education (projectors, panels, interactive and multimedia boards, multifunctional devices, web camera, projector screen, etc.).	unit.	-		-		1		1	

4.2	Carrying out automation of the educational process (testing, session management, student contingent movement, dean's office, department, faculty workload, schedule, library, syllabus)	Information management based on the automation of the educational process (testing, session management, student contingent movement, dean's office, department, faculty workload, schedule, library, syllabus)	fact.	+		+		+		+	
4.3	Replenishment of the full-text database of the results of scientific research of faculty and students, teaching staff (articles, monographs, etc.).	Increase in the number of results of scientific works of scientists, research of faculty and students, teaching staff (articles, monographs, etc.).	unit.	5		5		5		5	
4.4	Expanding the collection of scientific and educational literature, including electronic media for the educational programs being implemented	Ensuring the implementation of educational programs on the basis of modern educational and information resources, including electronic media	%	10		10		10		10	
4.5	Monitoring of filling and improvement of the faculty website	Formation of the Faculty website on various aspects of the implementation of educational programs.	%	20		20		20		20	

Head of department _____ **O.A. Stepanova**

REVIEWED

at the meeting of the Commission on Academic Quality
of the Research School of Physical and Chemical Sciences
Protocol of the meeting No. 1 dated 06.06.2024
Chairman _____ Kassymova Zh.S.

AGREED

Dean _____ Kasymov A.B.
06.06.2024