



NJSC SHAKARIM UNIVERSITY OF SEMEY

DEVELOPMENT PLAN EDUCATIONAL PROGRAM

6B07103 - Power Engineering

Semey

NON-PROFIT JOINT-STOCK COMPANY «SHAKARIM UNIVERSITY OF SEMEY»

APPROVED

Board member - Vice rector for academic affairs
I. Oralkanova

« 26 » 05 2023 .

DEVELOPMENT PLAN FOR THE EDUCATION PROGRAMME

6B07103 «Heat Power Engineering»
(code and name of the educational programme)
for the years 2023-2027

Semey 2023

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

1	Basis for the development	Shakarim University Strategic Plan 2021-2025 Faculty Plan of Work
2	Implementation timeframe	2023-2027
3	Expected results of the implementation	<p>Demonstrate socio-cultural, economic-legal, environmental knowledge and communicative skills,</p> <p>Apply information technologies taking into account modern trends in the development of society.</p> <p>Apply methods of calculation and selection of equipment for energy systems, ventilation and air conditioning systems based on the latest achievements of science and technology.</p> <p>To apply in cognitive and professional activity basic knowledge in the field of mathematics and natural sciences, methods of mathematical analysis and modelling, theoretical and experimental research in the field of power engineering.</p> <p>To apply in educational, scientific and professional activity the requirements to the graduate of the educational programme.</p> <p>rules, requirements and norms of documentation execution.</p> <p>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.</p> <p>To operate knowledge in the field of electrical engineering, measuring instruments, automation and information technologies in his/her subject area.</p> <p>Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the field of energy.</p> <p>Describe the principles of operation and heat engineering calculations of heat power and heat engineering plants and systems being developed and used.</p>

		<p>Carry out calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the technical task.</p> <p>Calculate and regulate energy production and distribution systems.</p>
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2. Analytical substantiation of the educational programme

2.1 Information about the educational programme

The educational programme 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 programme is 4 years.

EP «6B07103 - Heat Power Engineering» was developed by the Academic Committee

Considered at the meeting of the Quality Assurance Commission of the Faculty of Engineering and Technology (Minutes No. 4/6 of 10.04.2023).

Approved at the meeting of the Academic Council of the University (Minutes No. 8 of 25.04.2023).

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

2.2 Information about students

Academic year Basis of study	2023-2024 academic year	2024-2025 academic year	2025-2026 academic year	2026-2027 academic year
Grant	20	20	20	20
Contract	5	5	5	5
Total	25	25	25	25

2.3 Internal and external conditions of educational programme development

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

The department has an auditorium fund (Building 9) for conducting classes:

108 - Laboratory of Heat and Cold Technologies;

113 - laboratory of energy systems;

202 - lecture room;

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 - class of information technologies and CAD in power engineering.

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.

There is a Memorandum of Co-operation with the State Enterprise «Teplokommunenergo Semey» and a contract 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 programme, conducting classes and supervising practice, which contributes to better adaptation of students in the workplace.

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 tenge);

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

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

AP14871373 Development of supersonic arc metallisation technology for restoration of worn surfaces of crankshafts of internal combustion engines (76840457 tenge).

2.4 Information about the teaching staff implementing the educational programme

№	Indicators	Unit of measure	2023-2024 academic year	2024-2025 academic year	2025-2026 academic year	2026-2027 academic year
1	Share of teaching staff with academic degrees in the Programme of study	%	55	55	55	55
2	Including the share of teaching staff with a degree in general education disciplines cycle	%	40	40	40	40

The department employs full-time and part-time (industrial) teachers. 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-profit joint - stock company "Toraigyrov University". (18.04.2022 - 29.04.2022). Republic of Kazakhstan. Nur-Sultan, Pavlodar; Course on Leadership in Education (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;

Ermolenko M.V., Candidate of Technical Sciences - Renewable Energy Sources: Resources and Technologies (72 hours) Non-profit 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;

Kasymov 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 district heating systems (36 hours) Production and commercial firm "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 teaching methods as a condition for the development of professional competence of teachers of higher education institutions (40 hours) JSC National Centre for Professional Development "Orleu". (22.08.2022 - 26.08.2022). Kazakhstan. Semey; Renewable energy sources: resources and technologies (72 hours) Non-profit 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) "Rukhani zhangiru" webinar (128 hours) "Rukhani zhangiru" Kazakhstani Institutes. (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 educational process of distance learning (72 hours) Non-profit 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 educational process of distance learning (72 hours) Shakarim University of Semey. (07.07.2020 - 18.07.2020). Kazakhstan. Semey; Technologies of non-destructive testing (72 hours) Sarsen Amanzholov East Kazakhstan State University. (07.10.2019 - 25.10.2019). Ust-Kamenogorsk;

Zholbarysov I.A., Master - Technologies of non-destructive testing (72 hours) East Kazakhstan State University named after Sarsen Amanzholov. (07.10.2019 - 25.10.2019). Ust-Kamenogorsk;

Satybaldinova A.E., Master - "Active teaching methods as a condition for the development of professional competence of teachers of higher education institutions" (40 hours) JSC "National Centre for Professional Development "Orleu". (22.08.2022 - 26.08.2022). Kazakhstan. Semey; Reactor technologies (36 hours) RSE NNC RK. (16.11.2021 - 18.11.2021). Kazakhstan. Kurchatov; Radiation protection and safety (72 hours).KazSemProm LLP. (01.09.2021 - 19.11.2021). Kazakhstan. Semey;

Nurgaliev D.N., Master's Degree - Rukhani zhangiru (128 hours) Akparat zhane khangamdyk damu ministerligi. (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) Non-profit joint - stock company Shakarim University of Semey. (22.02.2021 - 10.03.2021). Kazakhstan. Semey; Special training of personnel responsible for nuclear and radiation safety (54 hours) LLP "Centre Meruert and Company". (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;

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

The faculty of the department has publications in journals from the list of the Committee for Control in Education and Science, in the databases Web of Science and Scopus, in the materials of international conferences.

Two teachers at the department were awarded the title of the best teacher of the university (Kasymov A.B. - 2021, Stepanova O.A. - 2022).

2.5 Characteristics of achievement of the educational programme

The students of the educational programme 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 (E P was opened in 2005):

- 2010 - 1st place Republican competition of research and development;
- 2011 - 1st place in the team competition, 1st and 2nd place in the individual championship Republican Subject Olympiad;
- 2011 - 1st and 3rd place Republican Research and Development Competition;
- 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 scientific research;

2012 - 2nd and 3rd place at the 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, undergraduates, 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 Programme and public foundation "RESO";

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

2013 - 3rd place team Republican Subject Olympiad;

2013 - 3 places Republican competition of research and development;

2013 - 2nd and two 3rd places Republican competition of projects among students, undergraduates, young scientists to promote renewable energy and energy efficient lighting in Kazakhstan, held by Chevron, Almaty University of Energy and Communications, UN Development Programme and RESO public foundation;

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

2014 - 2nd place team Republican Subject Olympiad;

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

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

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

2016 - 2nd place Republican Research and Development Competition;

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

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

2018 - 2nd and 3rd place Republican Research and Development Competition;

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

2019 - 3rd place Republican Research and Development Competition;

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

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

2022 - 2nd place Republican competition for research and development.

2019, 2020, 2022 Umyrzhhan 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 prize-winners (2nd place) in the Republican competition NIRS, students Manulenko A. and Aitkazin B. took 3rd place in the Republican competition NIRS.

The educational programme as a pilot programme is part of the Erasmus+ International Project (GekaWork KazDual) on the development of dual system of education

3 Main objectives of the educational programme development plan

The development plan is aimed at fulfilling the goal of the educational programme, which was formulated taking into account the requirements of the modern labour market. The aim of the educational programme: 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, realising these processes. Bachelor's training under this programme is carried out in close cooperation with the State Enterprise «Teplokommunenergo» of Semey. This approach in the education 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 programme development are given in Table 1.

Table 1 - Objectives for the development of the educational programme

No. n/a	Objectives of the EP development plan	Activities to fulfil the objective
1	Personnel training in the energy sector taking into account the demands of the internal and external labour market.	planning the work of the Chair taking into account the criteria for quality assessment and risk assessment in the training of personnel
2	Working with potential employers to develop and assess	joint development and implementation of the educational

	the learning outcomes of graduates of the educational programme	programme with employers; further development and improvement of dual training
3	Development of scientific potential of the educational programme	participation of teaching staff in competitions for grant funding of scientific research; active involvement of students in research activities

4. Risk analysis of the educational programme

№	Name of risks	Elimination measures
1	Decrease in the contingent of students on EP	Conducting promotional and explanatory work with applicants for the educational programme – « Heat Power Engineering»
2	Insufficient level of language skills to implement 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 retention rate of the teaching staff in the specialised programme	Incentivising faculty members to obtain and improve their academic degrees.

5. Action plan for the development of the educational programme

№	Criteria	Expected results	Unit of measure	2023-2024	2024-2025	2025-2026	2026-2027
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				Plan	Actual performance	Plan	Actual performance	Plan	Actual performance	Plan	Actual performance
Orientation 1. Educational and methodological support											
1.1	Updating the educational programme on the basis of professional standards, taking into account the recommendations of employers	Examination of the Educational Programme 6B07103 «Heat Power Engineering» in order to improve the practice-orientation and development of professional competences of graduates	fact.	-		+		-		+	
1.2	Monitoring and updating catalogues of elective disciplines in accordance with the development of key and professional competencies and labour market demands	Improving the quality of the content of educational programmes by including elective courses aimed at the development of key and professional competencies of graduates in accordance with the demands of the labour market.	fact.	+		-		-		-	
1.3	Introduction into the educational process of modern teaching technologies that promote the development of cognitive activity and communicative ability of students	Improving the quality of teaching of academic disciplines, taking into account the novelty and diversity of forms of work that contribute to the development of cognitive activity.	fact.	+		+		+		+	

1.3.1	Introduction of Massive Open Online Courses (MOOCs) on the educational programme 6B07103 «Heat Power Engineering» into the educational process	Introduction of disciplines into the educational process Improving the quality of teaching of academic disciplines, taking into account the novelty and diversity of forms of work that contribute to the development of cognitive activity.	unit.	-		-		1		1	
1.4	Involvement of social partners and employers in the development and expertise of the implementation of educational programmes	Improving the quality of educational programmes implemented, taking into account market demands and employers' 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	
1.6	Holding seminars and round tables on the application of innovative technologies in the educational process	Introduction of innovative technologies into the educational process	unit.	-		1		1		1	
1.7	Publication of educational, teaching, methodological and scientific literature on the implemented Programme of study	Improvement of teaching and methodological support for the disciplines of the implemented educational programmes	unit.	-		1		1		1	
1.8	Conclusion of agreements with foreign and domestic partner universities in order to develop academic exchange of students of all levels and faculty members	Creation of a base of foreign and domestic partner universities for the development of academic exchange of students of all levels and teaching staff	unit.	-		-		1		1	

1.9	Inviting students from partner universities to study for a semester, short-term internships, practical training, etc.	Development of international recognition of educational programmes, implementation of academic mobility programmes for students	people.	-		-		1		1	
1.10	Participation of faculty and students in international academic exchange programmes	Development of international cooperation with foreign universities implementing energy education programmes	people.	-		-		1		1	
1.11	Development of outgoing academic mobility of teaching staff and students in the energy sector	Improvement of the educational programme based on the experience of similar programmes in leading foreign universities	people.	-		-		1		1	
Orientation 2. Faculty members											
2.1	Professional development and training of scientific and pedagogical staff for the implementation of educational programmes once every 5 years	Share of teaching staff who have undergone advanced training at the national and international level at least 20%	people.	2		2		2		2	
2.2	Professional development, retraining, internships of teaching staff at the international level	At least 2 teachers undergoing a programme of professional development, retraining, internship of teaching staff at the international level	people.	2		2		2		2	

2.3	Promotion of faculty publications in international editions indexed by Web of Science and Scopus databases	Increase in the share of faculty members who have published the results of scientific research in publications indexed by Web of Science and Scopus databases - at least 30% of the total number of faculty members	%	30		30		30		30	
2.4	Involvement of practitioners in teaching and research activities	Participation of practitioners in the implementation of educational programmes (at least 20% of specialists)	%	20		20		20		20	
Orientation 3: Internationalisation of educational programmes											
3.1	Conclusion of agreements on international co-operation with foreign universities	Implementation of joint projects, preparation of scientific publications with foreign partners, creation of bases for scientific internships of students	unit.	-		-		1		1	
3.2	Attraction of foreign students to study in the educational programme 6B07103 «Heat Power Engineering»	Increase in the number of foreign students	people.	-		-		1		1	
3.3	Organisation 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		1	

3.4	Inviting foreign specialists to give lectures and consultations on master's projects and dissertations	Improvement of the content component of educational programmes on the basis of introducing the experience of foreign specialists in the implementation of educational programmes	unit.	1		-		1		1	
3.5	Expansion of cooperation with advanced foreign scientific and educational organisations in order to attract the most qualified foreign specialists to the implementation of educational programmes	Formation of key and professional competences in accordance with the practice of leading universities	people.	1		-		1		1	
Orientation 4: Logistics and digitalisation											
4.1	Step-by-step equipment of classrooms with technical means of education (projectors, panels, interactive and multimedia boards, multifunctional devices, web camera, projector screen, etc.)	Equipping classrooms assigned to the department with technical means of education (projectors, panels, interactive and multimedia boards, multifunctional devices, web camera, screen for projector, etc.).	unit.	-		-		1		1	
4.2	Automation of the educational process (testing, session management, student contingent movement, dean's office, department, faculty workload, timetable, library, syllabus)	Information management based on the automation of the educational process (testing, session management, student contingent movement, dean's office, department, faculty workload, timetable, library, syllabus)	fact.	+		+		+		+	
4.3	Replenishment of the full-text database of the results of scientific research of faculty members and students, teaching staff (articles, monographs, etc.).	Increase in the number of results of scientific works of scientists, research of teaching staff and students, teaching staff (articles, monographs, etc.).	unit.	5		5		5		5	

4.4	Expanding the collection of scientific and educational literature, including on electronic media for the educational programmes being implemented	Ensuring the implementation of educational programmes on the basis of modern educational and information resources, including electronic media	%	10		10		10		10	
4.5	Monitoring the content and improvement of the Faculty's website	Formation of the Faculty website on various aspects of the implementation of educational programmes.	%	20		20		20		20	

Head of department  Stepanova O.A.

REVIEWED

at the meeting of the Quality Assurance Commission
of the Faculty of Engineering - technological Protocol No. 4/6

Protocol No.5 of 25.05.2023

Chairman  G.B. Abdilova

APPROVED

Dean of the Faculty  G.N. Nurymkhan
May 26, 2023

