Ф.7.02-09

MINISTRY OF SCIENCEs AND higher EDUCATION OF THE REPUBLIC OF KAZAKHSTAN

M.O. AUEZOV SOUTH KAZAKHSTAN UNIVERSITY

«APPROVED»

Chairman of the board -

Rector \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Doctor of historical sciences,

Academician,

Kozhamzharova D.P.

«\_\_\_»\_\_\_\_\_\_\_\_\_\_2022

**Educational program**

**6В07140 - Heat Power Engineering**

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| Registration Number | 6В07100038 |
| Code and Classification of Education | 6В07 Engineering, processing and construction branches |
| Code and Classification of Areas of Training | 6В071 Engineering and engineering business |
| Group of educational programs (EP) | В162 Heat power engineering |
| Type of EP | *Operating EP* |
| ISCE level | 6 |
| NQF level | 6 |
| IQF level | 6 |
| Language learning | Kazakh, Russian |
| The complexity of EP | 240 credit |
| Distinctive features of EP | - |
| Partner University (JEP) - | - |
| University partner (DDEP) - | - |

Shymkent, 2022

Developers:

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| --- | --- | --- |
| Full Name | Position | Signature |
| Turymbetova Gulzuhra Djurabekovna | doctor PhD, associate professor, the head of the «Energetics and renewable energy systems» chair |  |
| Ilyasova Karlygash Urmatullaevna | senior lecturer of the «Energetics and renewable energy systems» chair |  |
| Yakubova Raissa Rivkatovna | associate professor of the «Energetics and renewable energy systems» chair |  |
| Temurali Arslan | student of the IP-19-2k group |  |
| Saliyeva Dilmira | student of the IP-21-2k group |  |
| Ongarbaev Kairosh Huseinovich. | General Director of JSC "3-Energoortalyk" | PP |
| Sabitov Perdebay Shmadiyarovich | Director of SUC "Kuatzhyluortalyk" | PP |
| Asanov Omar Buzaubaiuly | Chairman of the Board of  “Asia Trafo” LLP | PP |
| Goldstein Sergey Genrikhovich | General Director of JSC "KEGOK" | PP |
| Ibragimov Murat Jumasevich | General director of “Ontustik Zharyk –Transit” LLP | PP |

The EP was considered in the direction of training “Engineering and engineering business” at a meeting of the academic committee, рrotocol №\_\_\_\_\_ \_\_\_ «\_\_\_\_\_» \_\_\_\_\_\_ 2022 y.

Chairman of the Committee \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Aytureev M. Zh.**

The EP was considered and recommended for approval at Educational-methodical meeting of M. Auezov SKU

рrotocol №\_\_\_\_\_ « » 2022 y.

The EP was approved by the decision of the Academic Council of the University

рrotocol №\_\_\_\_\_ « » 2022 y.

**1. CONCEPT OF THE PROGRAM**

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| **University Mission** | Generation of new competencies, training of a leader who translates research and entrepreneurial thinking and culture |
| **University Values** | • Openness–open to change, innovation and cooperation.  • Creativity – generates ideas, develops them and turns them into values.  • Academic freedom – free to choose, develop and act.  • Partnership – creates trust and support in a relationship where everyone wins.  • Social responsibility – ready to fulfill obligations, make decisions and be responsible for their results. |
| **Graduate Model** | • Deep subject knowledge, their application and continuous expansion in professional activity.  • Information and digital literacy and mobility in rapidly changing conditions.  • Research skills, creativity and emotional intelligence.  • Entrepreneurship, independence and responsibility for their activities and well-being.  • Global and national citizenship, tolerance to cultures and languages. |
| **The uniqueness of the educational program** | • Orientation to the regional labor market and social order through the formation of professional competencies of the graduate, adjusted to the requirements of stakeholders  • Practical orientation and emphasis on the development of critical thinking and entrepreneurship, the formation of a wide range of skills that will allow to be functionally literate and competitive in any life situation and be in demand in the labor market |
| **Academic Integrity and Ethics Policy** | The University has taken measures to maintain academic integrity and academic freedom, protection from any kind of intolerance and discrimination:  • Rules of academic integrity (Minutes of the Academic Council No. 3 dated 30.10.2018);  • Anti-Corruption Standard (Order No. 373 n/k dated 27.12.2019).  • Code of Ethics (Protocol of the Academic Council No. 8 dated 31.01.2020). |
| **Regulatory and legal framework for the development of EP** | 1. Law of the Republic of Kazakhstan "On Education";  2. Standard rules of activity of educational organizations implementing educational programs of higher and (or) postgraduate education, approved by Order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 30, 2018 No. 595 with amendments and additions dated December 29, 2021 No. 614  3. State obligatory standards of higher and postgraduate education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated July 20.2022 No. 2;  4. Rules for organizing the educational process on credit technology of education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated April 20, 2011 No. 152;  5. Qualification directory of positions of managers, specialists and other employees, approved by order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated December 30, 2020 No. 553.  6. Guidelines for the use of ECTS.  7. Guidelines for the development of educational programs for higher and postgraduate education, Appendix 1 to the order of the Director of the Center for the Bologna Process and Academic Mobility No. 45 o / d dated June 30, 2021 |
| **Organization of the educational process** | • Implementation of the principles of the Bologna Process  • Student-centered learning  • Availability  • Inclusivity |
| **Quality assurance of the Educational program** | • Internal quality assurance system  • Involvement of stakeholders in the development of the Educational Program and its evaluation  • Systematic monitoring  • Actualization of the content (updating) |
| **Requirements for applicants** | It is established according to the Model Rules for admission to training in educational organizations, implementing educational programs of higher and postgraduate education, Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 600 dated 31.10.2018 |

**1. PASSPORT of the Educational program**

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| **Purpose of the EP** | 6V07140-Heat power engineering” - training of competitive specialists who meet the needs of the labor market, who have an integrated system that ensures professional activities in the field of heat power engineering. |
| **Tasks of the EP** | • formation of socially responsible behavior in the society, understanding the importance of professional ethical standards and compliance with these norms;  • providing with skills for lifelong learning that will allow graduates to successfully adapt to changing labor market conditions throughout all their professional careers;  • providing conditions for acquiring a high general intellectual level of development, mastering the culture of thinking and organizational skills in the field of heat and power engineering;  • formation of the competitiveness of graduates in the field of heat and power engineering to ensure the possibility of employment in the direction of training or continuing education in the magistracy. |
| **Harmonization of EP** | **•** 6th level of the National Qualifications Framework of the Republic of Kazakhstan;  • Dublin descriptors of the 6th level of qualification;  • 1 cycle of a Framework for Qualification of the European Higher Education Area);  • 6th Level of European Qualification Framework for Life long Learning). |
| **Connection of EP with the professional sphere** | * ORC Energetika (Minutes No. 05-13-3-4/PR dated July 25, 2019 of the meeting of industry commissions on social partnership and regulation of social and labor relations in the energy industry) |
| **Name of the degree awarded** | After the successful completion of this EP, the graduate is awarded " Bachelor of Engineering and Technology in the educational program 6B07140 -Heat Power Engineering " |
| **List of qualifications and positions** | Bachelors in ЕP 6B07140 – Heat power Engineering can hold primary positions:  • shop manager,  • deputy head of the workshop for operation,  • deputy head of the repair shop,  • head of testing and routine adjustment of equipment,  • process engineer,  • heat engineer,  • engineer for the organization of operation and repair,  • repair engineer,  • shift supervisor, engineer for calculations and modes,  • heat power engineer.  • engineer for thermal automation and measuring devices. |
| **Field of professional activity** | The branch of technology that includes the research, design, construction and operation of technical means for the production, conversion, application of heat and control of its flows. |
| **Objects of professional activity** | - thermal mechanical equipment;  - processes and complex technical systems related to the production of thermal and electrical energy;  - heat technology and electrical equipment;  - diagnostic systems and automated control of technological processes in the heat power industry;  - design documentation;  - regulatory and technical documentation and standardization systems;  - heat and mass transfer devices and pipelines of power plants and systems;  - boiler installations, turbo generators, compressors, fans, pumps. |
| **Subjects of professional activity** | - thermal and nuclear power plants;  - power plants and complexes based on unconventional and renewable energy sources;  - steam and gas turbines, power units.  - boiler installations and steam generators;  - superchargers and heat engines;  - heating systems and heating networks  - water and fuel treatment plants;  - automatic control of objects of thermal power plant systems;  - Repair and operation of thermal power equipment of thermal power plants. |
| **Types of professional activity** | - calculation and design  - design and engineering;  - organizational and managerial;  - production and technological;  - installation and commissioning;  - service and operational. |
| **Learning outcomes** | LO1 Communicate freely in the professional environment and society in Kazakh, Russian and English, understanding the principles and culture of academic integrity.  LO2 Demonstrate natural science, mathematical, social, socio-economic and engineering knowledge in professional activities, methods of mathematical data processing, scientific and experimental research, regulatory documents and elements of economic analysis.  LO3 Apply information and computer literacy; digital technology and application software.  LO4 Choose the water-chemical mode of heating networks, boiler units, heat engines and superchargers, the mode of regulating the operation of thermal processes.  LO5 Apply methods of analysis and calculation of the processes of thermodynamics, hydrodynamics, heat and mass transfer to increase efficiency in heat and power devices and apparatuses.  LO6 Apply the basic laws of electrical and magnetic circuits, methods of production, transmission and distribution of electrical energy, technical means for measuring thermal and electric power installations.  LO7 To make technical and economic calculations in the selection of heat and mass transfer devices, automatic control of thermal power plants and ways to solve environmental problems of thermal power.  LO8 Perform design, operational, installation and adjustment works of thermal power facilities, through modeling and optimization of thermal equipment, based on an analysis of the technical performance of turbines and auxiliary equipment.  **LO9** Conduct tests, organize and carry out repairs, operation and maintenance, protection against corrosion of heat power and heat technology equipment.  **LO10** Make decisions in non-standard situations, assess risks using research, entrepreneurial skills.  **LО11** Demonstrate the skills of self-education, self-education, a healthy lifestyle, teamwork.  **LO12** To carry out the collection and interpretation of information for the formation of judgments, taking into account social, ethical and scientific considerations, from the point of view of worldview, civil and moral positions. |

**3 EP GRADUATE COMPETENCIES**

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| **GENERAL COMPETENCIES** (SOFT SKILLS). Behavioral and personal skills | |
| GC 1. Literacy management | GC 1.1. The ability to self-educate, self-develop and constantly Up-to-Date knowledge in terms of chosen path with the interdisciplinarity conditions.  GC 1.2. The ability to express ideas, feelings, facts, opinions in professional environment and critical thinking skills. |
| GC 2. Language competence | GC 2.1. The ability to create communication programs in national, Russian and international languages.  GC 2.2. The ability for interpersonal, social and professional communication and mobility in intercultural communication. |
| GC 3. Mathematics and science competence. | GC 3.1. The ability and willingness to apply the educational potential, experience and personal qualities acquired during the study of mathematical, natural science, technical disciplines at the university to solve professional problems. |
| GC 4. Digital competence and technological literacy | GC 4.1. The ability to demonstrate and develop information literacy through the mastery and use of modern information and communication technologies in all areas of lives and professional activities.  GC 4.2. The ability to use various types of information and communication technologies: Internet resources, cloud and mobile services for the search, storage, protection, and dissemination of information. |
| GC 5. Personal, social and educational competence | GC 5.1. The ability for physical self-improvement and orientation for a healthy life to ensure full-fledged social and professional activities through methods and means of physical culture.  GC 5.2. The ability for socio-cultural development based on the manifestation of citizenship and morality.  GC 5.3 The ability to build a personal educational trajectory throughout life for self-development, career growth and professional success. |
| GC 6. Entrepreneurship competence | GC 6.1. The ability to be creative and enterprising in different environments.  GC 6.2. The ability to work in the mode of uncertainty and rapid change of task conditions, make decisions, allocate resources, and manage the time.  GC 6.3. The ability to work with consumer requests. |
| GC 7. Cultural awareness and self-expression | GC 7.1. The ability to show ideological, civic, and moral positions.  GC 7.2. The ability to be tolerant to the traditions and other people culture in the world, and to possess high spiritual qualities. |
| **PROFESSIONAL COMPETENCIES** (HARD SKILLS). | |
| PC 8.Natural Science competence | PC8.1. Ability to apply educational potential, experience and personal qualities, acquired basic knowledge in the field of thermal power engineering; apply basic concepts, laws and theories to solve heat and power problems, perform calculations, develop mathematical and natural science thinking. |
| PC9. Research competence | PC9.2. Successfully carry out research work, analyze the results and draw conclusions; possess the skills necessary for professional activities and continuing education in the magistracy. |
| PC10. Management competence | PC10.1. The ability to manage technological processes and projects in the thermal power industry to achieve professional goals, demonstrate entrepreneurial skills, evaluate production efficiency. |

**3.1 Matrix of correlating learning outcomes in the EP as a whole with the formed competencies**

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|  | **LО1** | **LО2** | **LО3** | **LО4** | **LО5** | **LО6** | **LО7** | **LО8** | **LО9** | **LО10** | **LО 11** | **LО 12** |
| GC1 | + |  | + |  | + | + | + | + | + | + | + | + |
| GC2 | + |  | + | + | + |  | + | + | + | + | + | + |
| GC3 | + | + | + | + | + | + | + | + |  |  | + |  |
| GC4 | + | + | + | + | + | + | + | + | + | + | + | + |
| GC5 |  | + | + |  |  |  |  |  |  | + | + |  |
| GC6 |  | + | + | + |  |  | + | + | + | + | + | + |
| GC7 | + | + |  |  |  |  |  |  |  |  | + | + |
| PC1 |  | + | + | + | + | + | + | + | + |  |  | + |
| PC2 |  | + | + | + | + | + | + | + | + | + |  |  |
| PC3 |  |  |  | + | + | + | + | + | + | + |  |  |

**4 MATRIX OF THE INFLUENCE OF DISCIPLINES ON THE FORMATION OF LEARNING OUTCOMES AND INFORMATION ON LABOR INTENSITY**

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| № | Module title | Cycle | UC/  EC | Component title | Brief discipline description | | Number of credits | Formed LО (codes) | | | | | | | | | | | | | | | | | | | |  | |  | |
| LО  1 | | LО2 | | LО3 | | LО4 | | LО5 | | LО6 | | LО7 | | LО8 | | LО9 | | LО10 | | LО11 | | LО12 | |
| 1 | Module of the Social Sciences | GED | ОC | History of Kazakhstan | The conceptual foundations of national history are studied, the origins, continuity of Kazakh statehood and topical problems of the history of modern Kazakhstan are interpreted. The activity of the national intelligentsia in the formation of the ideology of the liberation movement and the stages of socio-economic modernization of Kazakhstan is analyzed. The creation of a democratic legal state is considered. | | 5 |  | | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 2 | GED | OC | Philosophy | The basics of the emergence of philosophy are considered, the features of the emergence of the culture of thinking are revealed, the concepts of "philosophy", "worldview", the essence and content of the concepts of "being", "consciousness" are revealed. The relationship between the concepts of "cognition" and "creativity" is considered, the essence and content of the category of philosophy of freedom are revealed. The skills of correcting actions to highlight the essence of the philosophical problem of work individually and in a team, critical thinking, the skills of researching philosophical aspects, problems of practice and cognition are developed. | | 5 | v | | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 3 | Module of Socio-Political knowledge | GED | OC | Social and Political Studies | The theory of sociology, social structure and stratification of society are studied, the role and place of politics in society are explained, the main stages of the formation and development of political science, including youth policy, the role of politics in the system of public life, the essence of the state is revealed. The relationship between the state and civil society is revealed. The skills of sociological research, analysis of the socio-political structure of society are developed. | | 4 |  | | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 4 | GED | OC | Cultural Studies and Psychology | The socio-ethical values of society are studied as a product of integration processes in the systems of basic knowledge of the disciplines of the socio-cultural and psychological module. The features of psychological institutions are analyzed in the context of their role in the modernization of Kazakhstani society. Programs for resolving conflict situations in society, including in the professional society, are being formed. The skills are taught to correctly express and defend their own opinions. | | 4 |  | | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 5 | Module of Socio-ethnic development | GED | HSC/EC | Ecosystem and Law | Formation of integrated knowledge in the field of economics, law, anti-corruption culture, ecology and life safety, entrepreneurship, scientific research methods.  Fundamentals of safe human-nature interaction, ecosystem and biosphere productivity. The entrepreneurial activity of society in conditions of limited resources, increasing the competitiveness of business and the national economy. Regulation of relations in the field of ecology and human life safety. Knowledge and compliance of Kazakhstan’s law, obligations and guarantees of subjects, state regulation of public relations to ensure social progress. Application of scientific research methods. | | 5 |  | | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 6 | BD | ЕС | Mukhtar Study | The life and work of M.O.Auezov is studied; analyzes the writer's creative laboratory, his biography in context with creativity; as the creator of the science of Abaeology; researcher zhyr "Manas". Acquaintance with M. Auezov as a prominent public figure. The skills of analyzing the literary heritage of M.Auezov in world and oriental literature are being developed. Feelings of patriotism and love for the motherland are instilled. | | 3 |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | | v | |
| 7 | BD | ЕС | Actual Problems and Modernization of Public Consciousness | The actual problems of modern youth are being studied. The system of values in the youth policy of the Republic of Kazakhstan. Youth as an object of state policy. Law of the Republic of Kazakhstan "On state youth policy in the Republic of Kazakhstan". Youth policy in the modern world. | | 3 |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | | v | |
| 8 | BD | ЕС | Abay Study | The study of the life and creative heritage of Abai can be started with Alikhan Bokeikhanov, Akhmet Baitursynuly, Mirzhakyp Dulatuly. The work of the great poet, writer, public figure, and founder of modern Kazakh written literature, philosophy, social, aesthetic views of poetry in Kazakh poetry, contribution to the development of poetic language and a wide range of research works on musical heritage are analyzed. | | 3 |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | | v | |
| 9 | Module of Communication and Physical Education | GED | OC | Kazakh (Russian) Language | The basics of the development of cognitive and communicative activity in the Russian (Kazakh) language in the spheres of interpersonal, social, intercultural communication are studied. The skills of discussing ethical, cultural, socially significant norms in discussions, the ability to work in a team, teamwork, flexibility, creativity are instilled. Practical skills of interpreting text information, explaining their style and genre specifics in various spheres of communication are developed. | | 10 | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 10 | GED | OC | Foreign Language | Current trends and requirements for teaching and practical knowledge of foreign languages in everyday communication and professional activities are studied, aimed at increasing the general and communicative culture of future specialists, improving communication skills and skills, as well as improving the quality of vocational education. The fundamental foundations of a foreign language are formed and systematized. | | 10 | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 11 | GED | OC | Physical Training | The historical prerequisites for the formation and development of the physical education system on the territory of Kazakhstan, the role of physical culture and sports in the general education system, the integration of physical education into the world educational space are studied. The skills of a healthy lifestyle are taught, working individually and in a team. | | 8 |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | | v | |  | |
| 12 | BD | HSC | Professional Kazakh (Russian) Language | The skills of extracting the necessary information from the text, its interpretation in educational and professional communication are formed. The ability to establish contacts at a professional level, to build communications competently, based on the goals and situation of communication, develops. The ability to be creative, innovate, collegial, defend one's point of view in the process of building a program of speech behavior in Russian (Kazakh) in the field of professional communication is instilled. | | 3 | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 13 | BD | HSC | Professionally Oriented Foreign Language | Various types of speech activity in the spheres of professional and scientific communication, communicative tasks of the text, microthemes of the scientific text, the role of the sentence in the text, ways of developing information in the text, basic and additional information in the text are studied. A structural and semantic analysis of scientific texts, compression of a scientific text, secondary scientific texts are formed. The skills of creating a plan in the scientific field are instilled. | | 3 | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 14 | GED | OC | Information and Communication Technologies (in English) | Computer systems and software are being studied. Skills are formed on the use of information resources for searching and storing information, working with spreadsheets and databases. The skills of applying methods and means of information security, design and creation of websites, multimedia presentations, the use of e-government and electronic textbooks, various cloud mobile technologies, management of SMART technologies are taught. The skills of using digital technology for power supply systems are developed. | | 5 | ѵ | | ѵ | |  | |  | |  | |  | | ѵ | |  | | ѵ | |  | |  | |  | |
| 15 | Module of Mathematical and Еngineering-Scientific Basics | BD | HSC | Higher Mathematics | The basic concepts of a function of several variables, the ability to find partial derivatives, ordinary differential equations are studied. The ability to study the extremum of functions of several variables is being formed. The skills of computational literacy, solving multiple integrals, equations of different orders and types, theoretical knowledge of series theory for practical research of their convergence are taught, | | 5 |  | | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 16 | BD | HSC | Physics | Statistical and thermodynamic research methods, foundations of molecular kinetic theory, thermodynamic parameters, gas laws, entropy of an open nonlinear system, self-organizing systems are considered. The general characteristics of transport phenomena, oscillations and properties of electromagnetic waves and processes are studied. The skills of solving generalized typical tasks from different sections are taught. | | 4 |  | | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 17 | BD | ЕС | Сhemistry | The laws of transformation of substances are studied depending on the composition, structure and external conditions, and logical connections between different areas of knowledge, classes of inorganic substances, types of reactions, laws of stoichiometry.  The relationship between the structure and properties of chemical compounds is considered. The doctrines of the chemical process, electrochemical phenomena, the chemistry of the most important biogenic elements, and their identification are analyzed. Skills are acquired to apply general laws and principles of chemistry for their subsequent use in professional activities. | | 4 |  | | v | |  | | v | |  | |  | |  | |  | |  | |  | |  | |  | |
| 18 | BD | ЕС | Physical chemistry | To know the essence of chemical processes, the relationship of chemical and physical phenomena between themselves and with processes occurring in nature.  To apply the laws of chemical reactions, first of all, the conditions of chemical and phase equilibrium and the dependence of the directions of processes on a number of parameters; thermodynamics of solutions of electrolytes and non-electrolytes; issues of kinetics and catalysis. | | 4 |  | | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 19 | BD | HSC | Engineering Computer Graphics | The main provisions of descriptive geometry, engineering graphics, the practical implementation of general technical and specialized drawings in accordance with GOST, skills of working with modern computer programs in the environment of computer-aided design AutoCAD, 3D modeling, skills of constructing and reading technical drawings, creating theoretical models of thermal power objects are studied. | | 4 |  | | v | | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 20 | BD | HSC | Standardization and Certification | The theory of the system of technical regulation, standardization, ensuring the uniformity of measurements, legislative and regulatory documents, types and categories of standards are studied. The skills of applying standardization methods, certification schemes, requirements of technical regulations of the CU / Eurasian Economic Community, compliance with requirements for standardization, certification, metrological norms and rules by market entities are formed. The skills of assessing the economic efficiency of work on interstate and international standardization, certification, and metrology are taught. | | 4 |  | | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 21 |  | BD | HSC | Applied Mechanics | The questions of statics and kinematics, elements of the theory of mechanisms, methods of calculations for strength and rigidity of structural elements are considered. Obtaining the skills of calculating machine parts and mechanisms necessary for the successful development of special disciplines and subsequent activities during the operation of thermal power and heat engineering equipment. | | 4 |  | | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 22 | Module «Bases of Heat and Power Engineering» | BD | ЕС | Introduction to Speciality | | The article considers obtaining a general idea of the operation of a thermal power plant, familiarity with the design and operation of a power plant, with the properties of the working fluid and its features for the subsequent use of the knowledge gained in the study of the basic and variable part of professional disciplines.  The basic concepts of heat engineering and heat power engineering are studied. The skills of discussion on professional topics are acquired; terminology in the field of heat and electric energy production; software products for preparing presentations; searching for information about the production of heat and electric energy. | 4 |  | |  | | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 23 | BD | ЕС | Bases of Academic Writing | | The main features of the genres of academic writing are studied: essay, abstract, writing term papers and theses, abstract, review. Scientific articles are analyzed from the point of view of stylistics, the author's research strategy. The skills of reading, understanding, structuring and formatting their own scientific texts, referring to other scientific works, and substantiating their own opinion are acquired; the use of the Anti-Plagiarism program for detecting borrowings of written works. An understanding of the principles and culture of academic integrity is instilled. | 4 | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 24 |  | BD | ЕС | Electrical Engineering and Electronics | | The features and modes of operation of electric circuits of direct and alternating current, principles of operation and properties of electrical devices, their characteristics and practical use, fundamentals of electronics and microprocessor technology are studied. Skills for calculating and analyzing electrical circuits, choosing electrical devices, determining their characteristics for solving technological problems are formed | 4 |  | |  | | v | |  | |  | | v | |  | |  | |  | |  | |  | |  | |
| 25 | BD | ЕС | Bases of Digital Electronics | | The basics of digital electronics are studied; purpose, areas of application and methods of designing digital devices.  The principles of operation of digital electronics, basic elements of digital circuits, standard circuits for switching on these elements, algorithms for designing digital devices - from the simplest to the most complex - are considered. Skills of using digital devices in heat power engineering are being formed. | 4 |  | |  | | v | |  | |  | | v | |  | |  | |  | |  | |  | |  | |
| 26 |  | BD | ЕС | Theoretical Bases of Thermal Engineering | | The laws of ideal gases, 1,2 principles of thermodynamics, thermodynamic systems, real gases, water and water vapor, throttling, thermodynamic cycles of heat engines, heat conversion into electricity, refrigeration cycles, heat pumps and the principles of their use are studied. Skills of analysis and calculation of the efficiency of thermal power plants are being formed to increase the efficiency of their work. | 6 |  | |  | |  | |  | | v | |  | |  | |  | |  | |  | |  | |  | |
| 27 | BD | ЕС | Heat Engineering and Bases of Heat Power Engineering | | The laws of heat transfer are studied for the purpose of analysis, thermal engineering principles of operation and energy characteristics of thermal power systems. The modes, schedules and sources of heat in industrial enterprises are considered, as well as the use of non-traditional heat sources and internal (secondary) energy resources. The skills of calculating thermal equipment are being formed. | 6 |  | |  | |  | |  | | v | |  | | v | |  | |  | |  | |  | |  | |
| 28 |  | ChD | ЕС | Boiler Installations and Steam Generators | | Structures, characteristics and principles of operation of boilers, auxiliary mechanisms are studied; thermal calculations of the elements of boiler installations and the boiler unit as a whole are carried out. The skills of analyzing the technical condition of the boiler plant, its individual elements, the development of measures to improve the efficiency and reliability of boiler units are formed. | 6 |  | |  | |  | | v | |  | |  | | v | |  | |  | |  | |  | |  | |
| 29 | ChD | ЕС | Boiler Plants of Industrial Enterprises | | Structural elements of boiler units of various capacities and operating principles are being studied. The basics of fuel and water treatment for boiler units, ash collection and slag removal methods are considered. The skills of calculating the heat balance of the boiler unit are acquired, depending on specific conditions.  The skills of determining the operational parameters and characteristics of power equipment are taught | 6 |  | |  | |  | | v | |  | |  | | v | |  | |  | |  | |  | |  | |
| 30 |  | ChD | ЕС | Superchargers and Heat Engines | | The fundamentals of the theory and design of blowers and heat engines used in the technological chains of thermal power plants and industrial enterprises are studied. The skills of verification and design calculations of engines and superchargers are formed, their choice depending on their purpose, the assessment of the efficiency and reliability of superchargers and heat engines | 5 |  | |  | |  | | v | |  | |  | | v | |  | |  | |  | |  | |  | |
| 31 | ChD | ЕС | Compressors, Fans and Pumps | | The classification of compressors, fans and pumps, draft units is being studied; design and principle of operation of injection units. The basics of the theory of vane and positive displacement pumps are considered; main characteristics of compressors, fans and pumps. The skills of calculating the parameters and characteristics of pumps and fans are acquired. The skills are taught to analyze the features of operation, the principles of choosing the types of machines for specific energy systems, ensuring high efficiency and reliability of the installations. | 5 |  | |  | |  | | v | |  | |  | | v | |  | |  | |  | |  | |  | |
| 32 |  | BD | HSC | Educational Practice | | General ideas about the objects of professional activity are acquired in the form of excursions to enterprises; an acquaintance with the basics of future professional activity is carried out, information is provided on obtaining information about the specifics of the level of preparation of higher engineering education according to EP 6B07141 - Heat Power Engineering. The skills of working individually and in a team are instilled, correctly defending their point of view. | 2 |  | | v | | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 33 | Module «Materials and Thermodynamic Processe» | BD | ЕС | Structural Materials in Thermal Power | | The main and auxiliary materials, their properties and scope of application in the design of parts and assemblies are studied. The methodology of carrying out standard tests to determine the physical and mechanical properties and technological parameters of materials and products is considered. The skills of using modern devices to determine the technical condition and residual life of the equipment are acquired. The skills of applying the test methodology, adjustment and repair of technological equipment in accordance with the profile of the work are taught; modern methods of standard tests to determine the properties and parameters of materials and finished products. | 4 |  | |  | |  | | v | |  | |  | |  | |  | | v | |  | |  | |  | |
| 34 |  | BD | ЕС | Corrosion and Preservation of Thermal Power Equipment | | The fundamentals of the theory of metal corrosion are studied. The influence of various factors on corrosion processes, the form and types of corrosion damage, and the use of technology and schemes for the conservation of boilers of various parameters are considered. The skills of applying corrosion protection to operating equipment are acquired. Knowledge is formed to evaluate schemes and modes of conservation of boilers at low and high temperatures, turbines, heating networks and auxiliary equipment of TPPs. | 4 |  | |  | |  | | v | |  | |  | |  | |  | | v | |  | |  | |  | |
| 35 | BD | ЕС | Technical Thermodynamics | | The laws of technical thermodynamics are studied. The main thermodynamic processes in ideal and real gases are considered. The skills of using research methods and instruments are acquired; knowledge of the calculated ratios of heat engineering, methods of technical control in the conditions of existing production; effective use of heat machines and heat engineering installations; | 5 |  | |  | |  | |  | | v | |  | | v | |  | |  | |  | |  | |  | |
| 36 |  | BD | ЕС | Thermodynamic bases of Heat and Power Plants Cycles | | Modern methods of analysis and calculation of thermodynamic processes are studied in order to ensure reliable and efficient operation of thermal power and thermal mechanical equipment. Methods of direct conversion of thermal energy into electrical energy, calculations of thermal efficiency of cycles, analysis of work losses (exergy) in the main elements of the cycle are considered. The skills of applying the calculation of energy and exergetic losses in thermal power plants are acquired in order to increase their efficiency. | 5 |  | |  | |  | |  | | v | |  | | ѵ | |  | |  | |  | |  | |  | |
| 37 |  | BD | ЕС | Fluid and Gas Mechanics | | The laws of fluid and gas mechanics, theoretical methods for calculating the movement of fluid and gas in the elements of power and heat engineering equipment are studied.  The basic physical properties of liquids and gases, laws of statics and dynamics, practical application in heat power engineering are considered. The skills of applying the laws of mechanics in the hydraulic calculation of heat engineering equipment in heat power engineering are being formed. | 4 |  | |  | |  | |  | | v | |  | |  | |  | |  | |  | |  | |  | |
| 38 | BD | ЕС | Hydraulics and Gas Dynamics | | The basic physical properties of liquids and gases, general laws and equations of statics, kinematics and dynamics of liquids and gases; features of physical and mathematical modeling of one-dimensional, two-dimensional and three-dimensional flows; flows of incompressible and compressible flows of ideal and real liquids are studied. The methods of calculating the dynamics of the motion of the medium under the action of external and internal forces, the features of a continuous fluid medium; methods of experimental investigation of fluid flow processes are considered; The skills of carrying out calculations according to standard methods and designing individual parts and assemblies using standard design automation tools in accordance with the terms of reference are formed. | 4 |  | |  | |  | |  | | v | |  | |  | |  | |  | |  | |  | |  | |
| 39 |  | BD | ЕС | Heat and Mass Transfer | | The basic concepts and laws of heat and mass transfer, modeling, scaling in solving specific problems in the field of heat power engineering are studied, calculations of heat exchangers are considered. Skills of application of methods of analysis and calculation of heat and mass transfer devices are formed. | 6 |  | |  | |  | |  | | v | |  | | v | |  | |  | |  | |  | |  | |
| 40 | BD | ЕС | Basics of Heat Transfer and Mass Exchange | | The fundamental laws and regularities of heat and mass transfer, the basics of the theory of similarity in the transfer of heat and mass in thermal power plants are studied. Methods of analysis of heat and mass transfer processes and apparatuses are considered . The skills of determining the parameters of heat and mass transfer processes of heat power and heat technology installations and systems are being formed. | 6 |  | |  | |  | |  | | v | |  | | v | |  | |  | |  | |  | |  | |
| 41 | ChD | ЕС | Heat Exchange Processes and Apparatus | | The progressive principles and schemes of organization of heat and mass transfer equipment of heat and power enterprises are studied. The heat exchange equipment of enterprises is calculated for its subsequent selection, design and operation. The skills of engineering calculation of elements of heat and mass transfer devices, rational use of energy sources of TPPs are formed. | 5 |  | |  | |  | |  | | v | |  | | v | |  | |  | |  | |  | |  | |
| 42 |  | ChD | ЕС | Heat and Mass Transfer Equipment of Enterprises | | The sequence of technological processes carried out at TPPs is being studied; structure and characteristics of the steam-water and gas-air ducts; fuel preparation and ash removal system at coal-fired thermal power plants; gas supply system and fuel oil facilities. The composition and principle of operation of the main and auxiliary equipment are considered. Skills are formed to improve technological processes, design, operation, repair and commissioning of equipment at TPPs. | 5 |  | |  | |  | |  | | v | |  | |  | | v | | v | |  | |  | |  | |
| 43 |  | ChD | HSC | Industrial Practice І | | The activity of structural divisions and auxiliary services of the enterprise, technology, heat power equipment of the power company, working design documentation of heat power equipment of production are studied. Practical skills are acquired in the operation of thermal power plants and the selection of equipment, reporting, documentation and public protection. The necessary data is formed to optimize the heat supply system. Consolidation of knowledge in theoretical disciplines. The skills of working in a team and individually are taught. | 4 |  | |  | | v | |  | | v | |  | |  | |  | |  | |  | |  | |  | |
| 44 | Module «Heating Systems and Electrical Machines» | BD | ЕС | Sources and Systems of Heat Supply | | The structure of the heat supply system of industrial enterprises and residential areas is studied. Knowledge is acquired of determining thermal loads by types of consumption, performing calculations of heat supply systems, determining material and energy costs in heat supply systems and developing ways to reduce costs, implementing reliable and economical operation of main and auxiliary equipment in heat supply systems. Autonomous sources of heat and electricity operating on traditional and non-traditional fuel resources are considered. Skills are acquired in calculating the costs of thermal energy. | 4 |  | |  | |  | | v | | v | |  | |  | |  | |  | |  | |  | |  | |
| 45 |  | BD | ЕС | Heating Networks and Systems | | Centralized heat supply, thermodynamic bases of heating, the main ways to increase the efficiency of heating, modes of heat release from the CHP are studied. The method of thermal calculation of heat networks, heat losses is considered. Skills and abilities are formed in the design, selection of circuits and equipment, testing and operation of heating networks. | 4 |  | |  | |  | | v | | v | |  | |  | |  | |  | |  | |  | |  | |
| 46 |  | BD | ЕС | Electrical Machines of Thermal Power Plants | | The working characteristics of the types and the foundations of the general theory of electrical machines, the principles of their operation - transformers, asynchronous machines, synchronous machines and DC machines are considered. Skills of working with transformers, synchronous and asynchronous machines, DC motors are formed. | 4 |  | |  | |  | |  | |  | | v | |  | |  | |  | |  | |  | |  | |
| 47 |  | BD | ЕС | Power Supply and Electrical Equipment of Thermal Power Plants | | The principles of operation, technical characteristics, designs of transformers and electric motors are studied. The analysis of operating modes and characteristics of electromagnetic devices is carried out. Formation of theoretical skills in the design and construction of electrical equipment for thermal power plants. | 4 |  | |  | |  | |  | |  | | v | |  | |  | |  | |  | |  | |  | |
| 48 | Module «Power System and Automatic Control» | BD | ЕС | Computer Technologies in Heat Power Engineering | | Elements of numerical methods, algorithmic techniques, a computational experiment for research and modeling of processes, installations and systems of heat power engineering, ready-made packages of applied programs for performing heat power calculations are studied. Knowledge, skills, skills of using computer technologies for calculation, mathematical modeling of heat power and heat technology objects are formed. | 4 |  | |  | | v | |  | |  | |  | |  | | v | |  | |  | |  | |  | |
| 49 | BD | ЕС | Mathematical Modeling and Optimization of Thermal Power Systems | | Models and types of modeling, principles of constructing mathematical models, mathematical modeling of heat and mass transfer processes in heat and power systems, optimization problems of the main equipment of TPPs are studied. Skills and skills are formed in the application of modeling methods and optimization of heat and power processes, installations and systems of thermal power plants and industrial enterprises | 4 |  | |  | | v | |  | |  | |  | |  | | v | |  | |  | |  | |  | |
| 50 |  | BD | ЕС | Thermal Engineering Measurements and Control | | Modern methods and means of measurement and control of heat engineering quantities in the field of heat power engineering are being studied.  Practical skills are formed in organizing and conducting measurements, in processing measurement results using computer technologies to ensure reliable operation of equipment, assessing their accuracy and reliability, improving product quality and production efficiency | 3 |  | |  | | v | |  | |  | | v | |  | |  | |  | |  | |  | |  | |
| 51 | BD | ЕС | Automatic Control Systems in the Thermal Power Industry | | Methods of analysis and synthesis of automatic control and monitoring systems, research and modeling of dynamic systems using analog and digital technology are studied. The principles of automatic control, types and methods of control systems are considered. The skills of analyzing the stability of the operation of the automatic control and monitoring system in the heat power industry are formed. | 3 |  | |  | | v | |  | |  | | v | |  | |  | |  | |  | |  | |  | |
| 52 |  | BD | ЕС | Management and Innovation in the Heat Power Industry | | Modern innovative principles and methods of automatic control in heat and power systems are considered.  The skills of analysis and modeling of an automatic control system in heat power engineering are formed | 3 |  | |  | |  | |  | |  | |  | | v | | v | |  | |  | |  | |  | |
| 53 | BD | ЕС | Digitalization of Production | | Methods of regulating the main and auxiliary equipment of TPPs in automatic mode using modern IT technologies are being studied. Optimal schemes for regulating technological processes at an enterprise, information systems and subsystems for automated control of processes at TPPs, principles of operation of regulatory bodies of thermal power plants are considered. Skills are formed on the use of automated regulation and control of heat and power equipment at TPPs. | 3 |  | |  | | v | |  | |  | |  | | v | | v | |  | |  | |  | |  | |
| 54 | Module «Physical and Chemical Bases of Heat Engineering  » | ChD | ЕС | Physico - chemical Methods of Water Treatment | | The methods of operation of water treatment plants and physical  chemical modes of water treatment to ensure the operation of power plants and  heating network enterprises. Methods of water preparation and means for organizing a water-chemical regime, technological schemes of water treatment plants, principles of control and operation are considered. The skills of determining the technological parameters of water, methods of its purification, the choice and calculation of water treatment plants are formed. | 5 |  | |  | |  | | v | |  | |  | |  | |  | | v | |  | |  | |  | |
| 55 | ChD | ЕС | Technology of Water and Fuel Preparation | | Existing and new technologies for water treatment at thermal power plants, nuclear power plants and industrial enterprises are being studied. The technological schemes, designs of water treatment plants and systems of TPPs, technologies of rational use and neutralization of wastewater are considered. Skills are formed in the field of operation of water treatment plants and systems, selection and calculation of main and auxiliary equipment. | 5 |  | |  | |  | | v | |  | |  | |  | |  | | v | |  | |  | |  | |
| 56 |  | ChD | ЕС | Special Issues of Fuel Combustion | | The physicochemical foundations of the combustion of organic fuels are being studied. The properties and characteristics of fuels, methods of calculating combustion devices for burning various fuels, and calculating the processes of burning fuels in order to intensify them and reduce harmful emissions are considered. Skills are acquired in solving problems of the mechanism and theory of stabilization of combustion processes of fuels in various types of furnaces. | 5 |  | |  | |  | |  | | v | |  | | v | |  | |  | |  | |  | |  | |
| 57 | ChD | ЕС | Processes of Burning of Fuel | | Various types of fuels and innovative ways of burning fuels to produce heat and electricity are being studied. The types of serviced boilers, instrumentation and control devices are considered; application and implementation of new innovative technologies for fuel combustion, issues of removal and purification of combustion products in heat power engineering. Skills for the use of innovative equipment are formed и механизмов для сжигания топлива. | 5 |  | |  | |  | | v | | v | |  | | v | |  | |  | |  | |  | |  | |
| 58 |  | ChD | HSC | Industrial Practice ІI | | Consolidation and deepening of theoretical knowledge in the field of majoring discipline, development of practical skills for the development of innovative technologies by strengthening the component of the educational program in terms of research and development. Practical skills of operation are acquired in determining the operating modes of thermal power plants, drawing up a report, maintaining documentation and public protection. | 6 |  | |  | |  | | v | |  | | v | | v | |  | |  | |  | |  | |  | |
| 59 | Module  «Thermal Power Plant Equipment» | ChD | ЕС | Support Equipment of Thermal Power Plants | | The types of auxiliary equipment, designs, principles of operation, location in the technological scheme of a thermal power plant are studied. Thermal and hydraulic calculations of auxiliary equipment of TPPs, selection and evaluation of the efficiency of its work are considered. Practical skills of calculation, design, regulation, control and safety of auxiliary equipment are acquired. | 5 |  | |  | |  | |  | |  | |  | |  | | v | | v | |  | |  | |  | |
| 60 | ChD | ЕС | Testing and Commissioning of Thermal Power Plants | | Testing and adjustment methods are being studied thermal power plants, adjustment and maintenance of automation systems and power electrical equipment, adjustment of the technological mode of equipment for water treatment plants (WPU). Methods of ensuring the reliability of maintenance are considered; modern methods of testing, design, modernization of technological equipment, measures to improve operational characteristics, increase environmental safety, save resources of heat power, heat engineering and heat technology equipment. Skills are formed methods of ensuring uninterrupted operation, correct operation, repair and modernization and ensuring the reliability of thermal power plants. | 5 |  | |  | |  | |  | |  | |  | |  | | v | | v | |  | |  | |  | |
| 61 | ChD | ЕС | Modes of Work and Operation of Thermal Power Plant Equipment | | The methods, types, volumes and nature of the work carried out on the operation of the main elements of the thermal power equipment of TPPs are being studied; theory of operation of heating network equipment. The features of the operation of TPP equipment as part of the interconnected power systems are considered; main tasks of operation and dispatching load schedule; operation mode management; the main issues of operation of CHP and heating networks. The skills of determining the technical and economic indicators of TPPs at various loads are formed. | 5 |  | |  | |  | | v | |  | |  | |  | | v | | v | |  | |  | |  | |
| 62 | ChD | ЕС | Repair and Maintenance of Heat and Power Equipment | | The methods of scheduling the installation of equipment and the theory of planning preventive maintenance of heat and power equipment are studied. The reasons for malfunctions and failures in the operation of thermal power equipment are considered. Skills are formed in carrying out repair work, operating and quality control of heat and power equipment. | 5 |  | |  | |  | | v | |  | |  | |  | | v | | v | |  | |  | |  | |
| 63 | ChD | ЕС | Steam and Gas Turbines and Installation of Thermal Power Stations | | The principles of operation, design and operation of steam and gas turbines, design of turbines, energy losses and ways to improve the efficiency of turbines are studied. Thermal and strength calculations of steam and gas turbines and installations and their elements are considered. Skills in the calculation and selection of steam and gas turbines are formed. | 6 |  | |  | |  | | v | |  | |  | |  | | v | | v | |  | |  | |  | |
| 64 |  | ChD | ЕС | Design of Thermal Power Plants | | The layout of the equipment of TPPs, methods of calculating thermal schemes of TPPs and TPPs are being studied. The choice of auxiliary equipment and an industrial site for the construction of TPPs, the calculated thermal scheme of TPPs and TPPs, determination of steam consumption per consumer, calculation of the balance of process and live steam, technical and economic indicators of TPPs are considered. Skills are formed in the development and implementation of measures to improve the efficiency of TPPs. | 6 |  | |  | |  | | v | |  | |  | |  | | v | | v | |  | |  | |  | |
| 65 | Module «Production, Distribution and Use Energy Sources» | BD | ЕС | Thermal Power Systems and Energy Use | | The structure of the power industry of the Republic of Kazakhstan, characteristics of energy carriers, systems of production and consumption of heat and electric energy are studied. Energy use in industrial and heat technology production is considered. The skills of calculating the heat engineering characteristics of the main heat technological installations, systems of production and consumption of heat and electric energy are formed. | 4 |  | |  | |  | |  | | v | | v | |  | |  | |  | |  | |  | |  | |
| 66 | BD | ЕС | Systems of Production and Distribution of Energy Carriers of Industrial Enterprises | | The structure, characteristics and modes of operation of the systems of production and distribution of energy carriers, the scale of consumption of energy carriers by industrial enterprises are studied. The directions of rational production and use of heat and electric energy, methods of modernization of existing equipment are considered. The skills of applying methods of analysis, synthesis and optimization of technological processes are formed; the use of algorithms and programs for calculating the parameters of TPP. | 4 |  | |  | |  | |  | | v | | v | |  | |  | |  | |  | |  | |  | |
| 67 |  | BD | ЕС | Unconventional and Renewable Energy Sources | | The types and methods of using non-traditional energy sources used in heat power engineering are being studied. The scientific and technical foundations of the use of non-traditional energy sources, technological schemes, equipment based on various types of NIE, methods of resource conservation are considered. Skills are formed on the effective use of research and development and resource conservation for heat and power supply. | 3 |  | |  | |  | |  | |  | | v | |  | |  | |  | |  | |  | |  | |
| 68 | BD | ЕС | Energy Saving in Heat and Electricity Production Systems | | The basics of energy saving, organizational and technological measures in TPPs for the production and distribution of heat and electric energy are being studied. The fundamentals of the legislative base of the state energy saving policy and environmental protection activity are considered; use of renewable sources of fuel and energy (RES), secondary energy resources and non-traditional energy sources in heat power engineering. Skills are formed for calculating the energy-saving effect from the utilization of heat from flue gases of operating CHPPs and boiler houses, the rates of heat consumption in the production of heat and electricity. | 3 |  | |  | |  | |  | |  | | v | | v | |  | |  | |  | |  | |  | |
| 69 | Module «Economics and Environmental Problems in Heat and Power Engineering» | BD | ЕС | Energy Audit and Monitoring of Thermal Power Plants | | The analysis of the technical condition of the main equipment of TPPs, ways of increasing the efficiency of the equipment is being studied. The article considers the methodology of energy audit and monitoring of TPPs, drawing up an energy balance and an energy certificate of equipment and systems of TPPs. Skills are formed on the methods of rationing energy resources and losses. | 3 |  | |  | |  | |  | | v | |  | |  | |  | |  | | v | |  | |  | |
| 70 | BD | ЕС | Production Planning and Management | | The planning and control systems of heat and power production are studied. The functions of management, types of control systems, the basics of planning heat power production, methods of organization, planning and management of scientific research and innovation in heat power engineering are considered. Skills in production planning and management are formed. | 3 |  | |  | |  | |  | |  | |  | |  | |  | |  | | v | | v | |  | |
| 71 |  | BD | ЕС | Environmental Technologies at Thermal Power Plants | | The basics of the theory of purification, methods and technologies for purifying flue gases from sulfur oxides and nitrogen oxides are studied. Considered methods for calculating the dispersion of harmful substances in the atmosphere, problems of environmental protection environment from the operation of a heat-and-power facility and the choice of environmental technologies. Skills for the use of methods for assessing economic damage from pollution atmosphere are formed. | 3 |  | |  | |  | |  | |  | |  | | v | |  | |  | |  | |  | |  | |
| 72 |  | BD | ЕС | Environmental Problems of Heat and Power Engineering | | The ecological problems of thermal power engineering, the negative consequences of the impact of energy on the environment are being studied. The tasks of environmental measures in the heat power industry are considered; selection, calculation and operation of cleaning equipment and equipment for capturing harmful substances of technological and thermal emissions. The skills of using algorithms and programs for calculating the emission parameters of TPP equipment, developing generalized solutions to environmental problems are being formed. | 3 |  | |  | | v | |  | |  | |  | | v | |  | |  | |  | |  | |  | |
| 73 | Module Acquisition of New Professional Competencies | BD | ЕС | Subjects on - the Additional Educational Program | | A set of disciplines and (or) modules and other types of educational work, assigned to a student for study in order to form additional competencies | 12 |  | | v | | v | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 74 | Module of Final Certification | ChD | HSC | Predegree or Industrial Practice | Practical skills of setting goals, tasks, problem definition and ways of solving them are instilled. Collection and analysis of practical material on the topic of the final qualifying work.  Skills are acquired in scientific research and analytical thinking, the ability to apply new modern methods of developing technological processes in the field of heat power engineering with the definition of rational technological modes and in-depth study of the production activities of the main and auxiliary equipment. | | 8 |  |  | |  | |  | |  | |  | |  | | v | | v | | v | |  | |  | |
| 75 |  |  | Writing and Defending a Thesis, a Graduate Work, or Preparing and Passing a Comprehensive Exam | Description and solution of technical problems in the field of heat power engineering, development of heat supply systems, analysis of options for technical solutions in the design of heat and power facilities, assessment of the technical and economic advantages of the adopted technical solutions, assessment of the impact of equipment on the cost of products, the use of applied computer programs. | | 12 |  |  | | v | |  | |  | |  | | v | | v | | v | | v | |  | |  | |

**5 SUMMARY TABLE REFLECTING THE VOLUME OF MASTERED CREDITS BROKEN DOWN EDUCATION PROGRAM MODULES**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Course of Study | Semester | The number of mastered modules | The number of studied disciplines | | | Number of KZ credits | | | | Total hours | Total KZ credits | The number of | |
| OC | UC | EC | Theoretical training | Diff. pass | Industrial practice | Writing and defense of degree work | exam | Diff. pass |
| 1 | 1 | 4 | 6 |  | 1 | 30 | - |  |  | 900 | 30 | 6 | 1 |
| 2 | 4 | 3 | 4 | 1 | 28 | 2 |  |  | 900 | 30 | 5 | 3 |
| 2 | 3 | 5 | 1 | 2 | 5 | 30 | - |  |  | 900 | 30 | 6 | 2 |
| 4 | 5 | 3 | 3 | 1 | 26 | - | 4 |  | 900 | 30 | 5 | 2 |
| 3 | 5 | 7 |  | 1 | 6 | 30 | - |  |  | 900 | 30 | 6 | 1 |
| 6 | 4 |  | 1 | 3 | 24 | - | 6 |  | 900 | 30 | 3 | 1 |
| 4 | 7 | 5 |  |  | 5 | 20 | - |  |  | 600 | 20 | 5 |  |
| 8 | 3 | - |  | 4 | 20 | - |  |  | 600 | 20 | 4 |  |
|  | 9 | 2 |  |  |  |  | - | 8 |  | 600 | 20 | - |  |
| Total | |  | 13 | 11 | 26 |  | 2 | 18 | 12 | 7200 | 240 | 40 | 10 |

**6 LEARNING STRATEGIES AND METHODS, MONITORING AND EVALUATION**

|  |  |
| --- | --- |
| **Learning strategies** | **Student-centered learning:** the learner is the center of teaching/learning and an active participant in the learning and decision-making process.  **Practice-oriented learning:** focus on the development of practical skills. |
| **Learning methods** | Conducting lectures, seminars, various types of practices with:  • application of innovative technologies:  - problem learning;  - case study;  - work in groups;  - discussions and dialogues, intellectual games, business games;  - virtual laboratory work;  - methods of reflection, projects, benchmarking;  - presentations;  • rational and creative use of information sources:  - multimedia training programs;  - electronic textbooks;  - video lectures, video films;  - digital resources.  Organization of independent student work, individual consultations. |
| **Monitoring and assessing the achievability of learning outcomes** | **Current control** on each topic of a discipline, control of knowledge in in-class and out-of-class activities (according to a syllabus). Assessment forms:  • questioning in the classroom;  • testing on the topics;  • test;  • defending student independent works;  • virtual laboratory work;  • discussions;  • trainings;  • colloquia;  • essays, etc.  **Midterm control:** at least two times during one academic period within each academic discipline.  **Intermediate attestation** is carried out in accordance with the working curriculum, academic calendar.  Conduct forms:  • exam in the form of testing;  • oral exam;  • written exam;  • combined exam;  • defense of term works/projects;  • defense of practice reports.  **Final state attestation:** defense of a thesis or passing a comprehensive exam. |

**7 EDUCATIONAL AND RESOURCE SUPPORT OF THE EDUCATION PROGRAM**

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| **Information Resource Center** | There are 6 library departments, 16 reading rooms, 2 electronic resource centers (ERC) in the structure of the Information Resource Center. The network infrastructure of the IRC is based on 180 computers with Internet access, 110 workstations, 6 interactive whiteboards, 2 video doubles, 1 video conferencing system, 3 A-4 format scanners. The IRC software includes AIBS “IRBIS-64” for MS Windows (the basic set consisting of 6 modules), stand-alone server for uninterrupted operation in the IRBIS system.  The library fund is in the electronic catalog available to users on the site <http://lib.ukgu.kz> on-line 24 hours 7 days a week.  Own thematic databases have been created: “Almamater”, “Proceedings of SKU scientists”, “Electronic archive”. Online access from any device in 24/7 mode via an external link <http://articles.ukgu.kz/ru/pps>.  Work with catalogs in electronic form. The Electronic Catalog consists of 9 databases: “Books”, “Articles”, “Periodicals”, “Proceedings of the SKU teaching staff”, “Rare Books”, “Electronic Fund”, “SKU in Print”, “Readers”, and “South Kazakhstan Oblast”.  The IRC provides its users with 3 options for accessing their own electronic information resources: using the “Electronic Catalog” terminals in the catalog hall and in the IRC subdivisions; through the information network of the university for faculties and departments; remotely on the library website <http://lib.ukgu.kz/>.  Open access:   * to international and republican resources: “SpringerLink”, “Polpred”, “Web of Science”, “EBSCO”, “Epigraph”; * to electronic versions of scientific journals in the public domain, “Zan”, “RMEL”, “Adebiet”, Digital library “Aknurpress”, “Smart-kіtаp”, “Kitаp.kz”, etc.   For persons with special needs and disabilities, the IRC has adapted the library website for the work of visually impaired users. |
| **Material and technical base** | The material and technical base of the **«**Power Engineering and Unconventional Energy Systems**»** department includes the following rooms and laboratories for undergraduate students:  - educational laboratory "Laboratory installations for testing various designs of heat exchangers" 117g  - Educational Laboratories No. 503g, No. 504g, No. 505g, No. 124g  - Computer classes - No. 506g;  - classrooms with an interactive whiteboard for lectures 504G  - Educational-scientific-practical complex organized in JSC "Energoortalyk-3";  - In the GKP "Kuatzhyluortalyk-3" a branch of the department was organized;  Students also use the services of general use university laboratories - Testing Regional Laboratory of engineering profile “Construction and Biochemical Materials” and Research and Testing Center SAPA to perform chemical and physico-chemical analysis. |

**APPROVAL SHEET**

for the Educational program "6В07140 - Heat Power Engineering"

Директор ДАВ\_\_\_\_\_\_\_\_\_\_\_\_

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