NCJSC «S. Seifullin Kazakh Agrotechnical Research University»

APPROVED
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CATALOG OF ELECTIVE DISCIPLINES
according to the educational program 6B07110 - «Thermal Power Engineering»

Astana 2024

Catalog of elective disciplines. – Astana, 2024.

This catalog contains a list and content of elective component disciplines, prerequisites and post-prerequisites of elective disciplines, as well as the corresponding volume of loans offered by the university for the development of educational programs of the Bachelor's degree **6B07110 - «Thermal Power Engineering»** and is intended for students under the credit system.

№	The name of discipline (Code of subject)	Discipline cycle/ Component	Number of credits	Course/ Academic period	Pre-requisitions	Post-requisitions	Brief content of the discipline
1	Warm mass-transfer (Тер 1226)	BS/ES	5	1/1	Physics	Boiler plants and steam generators, Heat networks and heat supply systems, Steam and gas turbines, Superchargers and heat engines	Theoretical foundations of engineering methods for calculating thermal processes are studied; more complex problems of convective heat transfer are also considered, including the problems of thermal convection, melting - crystallization, evaporation - condensation, methods for solving heat transfer problems. Students receive analytical solutions to the simplest problems, get acquainted with the methods of constructing self-similar solutions, as well as numerical methods for solving nonlinear problems of convective heat transfer.
2	A heat transfer is in heating engineering processes and installations (TTPU 1227)	BS/ES	5	1/1	Physics	Boiler plants and steam generators, Heat networks and heat supply systems, Steam and gas turbines, Superchargers and heat engines	Formation of students' knowledge in the field of fundamental laws and methods of analysis and calculation of heat transfer processes in heat exchangers, efficient operation of heat engineering equipment using modern methods of using heat, characteristics of the thermal state of elements of thermal machines and devices. Mastering practical skills to determine the characteristics of heat and mass transfer processes in heat engineering installations. теплотехнических установках.
3	Digital competencies in professional activities (Minor) (CKPDM 1253)	BS/ES	5	1/2	Information and communication technologies	Multimedia technologies (Minor)	The study of the discipline considers modern trends in the development of new digital technologies, the main ways of their application in science and education, as well as the application of basic methods, ways and means of obtaining, storing and processing information in solving professional problems.
4	Computer technologies are in calculations (KTTR 1210)	BS/ES	5	1/2	Information and communication technologies	Multimedia technologies (Minor)	Formation of students' knowledge, skills and abilities of using computer programs and technologies for calculating heat

							power facilities. Mastering the skills of using drawing software, modeling heat and power processes and heat power equipment, applying numerical methods to solve heat engineering problems, using application programs for data processing and performing heat engineering calculations.
5	Basics of anti-corruption culture (OAK 1224)	BS/ES	3	1/2	Political science and sociology	Basics of the scientific researches	The course forms a system of knowledge on combating corruption, and the development on this basis of a civil position in relation to this phenomenon. As a result of mastering the discipline, students will be able to: navigate the legislation; analyze and apply legal acts in specific situations, follow moral
6	Basics of financial literacy (OFG 1225)	BS/ES	3	1/2	Mathematics 1, 2	Economics and Entrepreneurship, Energy saving and energy efficiency in heat power engineering and heat technology	The course provides knowledge in understanding the planning of expenses and income, the formation of a safety cushion, the use of necessary financial information, rationally choose financial products and services, responsibly approach issues related to lending, defend their legitimate rights and interests as a consumer of financial services.
7	Technological bases of preparation of the water and fuel at thermal power plants and industrial enterprises (TOPVTTPP 1227)	BS/ES	5	1/2	Theoretical basics of heat engineering	Boiler plants and steam generators	Study of quality requirements, and methods of preparation of the make-up water of the station and heating networks. Knowledge of the skills of preparation, transportation of water, modes of operation of equipment and systems for water preparation and purification, determination of the dependence of technical and economic indicators on regime parameters, methods of chemical control over the state of water; methods of preparation of solid, liquid and gaseous fuels.
8	Physical and chemical methods of preparation of water (FHMPV 1226)	BS/ES	5	1/2	Theoretical basics of heat engineering	Boiler plants and steam generators	Formation of students' knowledge, skills and abilities in the application of modern physical-chemical, ion-exchange, thermal, membrane methods of water

							purification both for low-pressure, high-pressure heat and power equipment of boiler houses and thermal power plants, and for heating networks, wastewater. Mastering the characteristics of natural waters, schemes of water circulation in the tract, the technological process of water treatment.
9	High temperature processes and installations (VPU 2327)	AS/ES	8	2/1	Theoretical basics of heat engineering	Steam and gas turbines	The study of types of high-temperature heat engineering installations, their characteristics, principles of operation, features of operation and their scope. Possession of methods of operation of reactors and energy sources of high-temperature heat technological installations; be able to put into practice the principles of organization of technological processes, determine their individual stages in thermal reactors, structural diagrams of high-temperature thermal technological installations.
10	Autonomous heat supply (AT 2345)	AS/ES	8	2/1	Theoretical basics of heat engineering	Heat networks and heat supply systems	Formation of skills necessary to understand the processes and phenomena associated with the heat supply system. Acquisition by students of theoretical knowledge and practical skills on the basics of design, installation and operation of autonomous heat supply systems, on the use of methods for determining calculation indicators for the design of autonomous heat supply systems, knowledge of modern technological equipment of autonomous heat supply systems.
11	Energy saving and energy efficiency in heat power engineering and heat technology (EETT 2341)	AS/ES	8	2/2	Theoretical basics of heat engineering	Calculation of efficiency in thermal power engineering	Formation of students' knowledge and skills in the field of legal, organizational, scientific, industrial, technical and economic measures aimed at the efficient use of energy resources. Skills for evaluating the efficiency of using energy carriers in energy

							complexes, compiling energy balances, analyzing an organization's energy passport, developing and implementing energy-saving technologies.
12	Economics and Entrepreneurship (EPP 2343)	AS/ES	8	2/2	Theoretical basics of heat engineering	Calculation of efficiency in thermal power engineering	The concept of an enterprise as a subject and object of business activity; The products of the enterprise, its competitiveness; Production resources of the enterprise; Enterprise - an economic entity of the market; Joint stock companies; Small businesses; Taxation of small businesses; Organization and registration of a business firm; Competition in the business system; Commercial activities of the company; Business infrastructure; Marketing in the business system; Management in the activities of the enterprise; Management Motivation
13	Professionally-oriented Foreign Language (POIYa 2255)	BS/ES	3	2/2	Foreign language	Multimedia technologies (Minor)	Forms the professional foreign language speech of future specialists to increase the level of professional competence, proficiency in a professional foreign language for the implementation of written and oral information exchange, further development of speech activity. Rules of speech behavior in accordance with situations of professional communication, depending on the style and nature of communication in the social, household and academic spheres.
14	Fundamentals of Artificial Intelligence (OII 2254)	BS/ES	3	2/2	Information and communication technologies	Multimedia technologies (Minor)	"Fundamentals of Artificial Intelligence" is an introductory course designed to introduce students to the basic concepts, methods, and applications of artificial intelligence. Upon completion of the course, students will acquire the knowledge and skills necessary to understand the fundamentals and application of artificial intelligence (AI) technologies in accordance with the profile of the training area.

15	Steam and gas turbines (PGT 2326)	AS/ES	5	2/2	Boiler plants and steam generators, Superchargers and heat engines	Thermal power systems and energy use	Formation of knowledge on the types, designs, thermal schemes of steam and gas turbines, the features of their operation. Developing the skills to analyze the current state of steam turbine equipment and formulate recommendations for improving the energy efficiency of the main equipment, master the methodology for calculating steam and gas turbines, as well as the ability to compare, formulate conclusions, build their own arguments, express and justify their position.
16	Operation of heating equipment (ETO 2344)	AS/ES	5	2/2	Boiler plants and steam generators, Superchargers and heat engines	Thermal power systems and energy use	Study, equipment, technology and features of operation of heat engineering installations. Acquaintance with the regulatory documentation for the organization of operational work, with supervision during the manufacture, installation, commissioning, testing and commissioning of manufactured products and objects. Preparing students to lead a team of performers, make decisions, determine the order of work.
17	Special Issues of Fuel Combustion (SVST 2259)	BS/ES	5	2/2	Theoretical basics of heat engineering	Operation modes of thermal power plants	Formation of knowledge on: methods of fuel combustion and organization of combustion processes in boiler plants of stations and small boiler houses; modern technologies for fossil fuel combustion with the highest economic and environmental efficiency: the mechanism of the formation of harmful substances in the combustion process, the dependence of the temperature regime on the formation of nitrogen oxides; organization of liquid and solid ash removal in boiler furnaces.
18	Fuel and combustion theory (TTG 2259)	BS/ES	5	2/2	Theoretical basics of heat engineering	Operation modes of thermal power plants	Formation of students' knowledge on: fuel preparation and fuel supply, the theory of combustion of organic fuels and skills for their practical application in the organization of combustion processes.

							Possession of information about the fuel and energy balance of the Republic of Kazakhstan, the role of various types of energy fuel in the national economy, the skills to perform basic technological calculations of combustion processes.
19	Thermal power systems and energy use (TSE 3325)	AS/ES	6	3/1	Boiler plants and steam generators, Steam and gas turbines	Graduation project	Formation of knowledge: general principles, structure and functioning of sources and systems of heat and power supply; the basics of designing heat supply systems for industrial enterprises and the public sector, understanding the principles of building a heat and power system of an industrial enterprise, applying the acquired knowledge to calculate thermal schemes of heat sources, determining the need for steam and hot water for industrial consumers and the public sector.
20	Theoretical foundations of thermal power plants (TOTES 4303)	AS/ES	6	3/1	Boiler plants and steam generators, Steam and gas turbines	Graduation project	Familiarization of students with the main characteristics and operating parameters of power plants, electrical and thermal loads of thermal power plants, basic thermal diagrams, their elements and technical and economic indicators of the operation of power units of thermal power plants and IES. Possession of methods for determining the needs of enterprises in thermal and electrical energy, replenishment of steam and condensate losses, principles for constructing and calculating thermal schemes of thermal power plants.
21	Implementation of technological processes and environmental technologies at thermal power plants (RTPPTT 3325)	AS/ES	7	3/1	Boiler plants and steam generators	Pre diploma practice	Training of specialists for the implementation of environmental technical policy in the design, installation and operation of thermal power equipment of thermal power plants. Formation of knowledge in the field of the legislative framework of the environmental policy of the Republic of Kazakhstan, methods for reducing

							harmful impurities by modes during the operation of thermal power equipment, technologies and schemes for cleaning waste water and gases from harmful impurities, environmental regulation of harmful emissions.
22	Environmental technologies in fuel combustion (PTPST 3326)	AS/ES	7	3/1	Boiler plants and steam generators	Pre diploma practice	Formation of students' knowledge about the harmful factors that arise when fuel is burned on thermal power equipment, ways to minimize and suppress them; ability to apply methods for determining the characteristics of emissions of harmful substances and their impact on the environment; acquisition of practical skills in regulation of emissions, radiation safety and payment for harmful emissions.
23	Multimedia technologies (Minor) (MTM 3324)	AS/ES	5	3/1	Computer technologies are in calculations, Digital competencies in professional activities (Minor)	Pre diploma practice	The discipline provides features and procedure of designing multimedia objects, processing of multimedia information, functionality of modern programs and information and communication technologies used to create and modify multimedia products to solve practical problems in professional activities.
24	Calculation of efficiency in thermal power engineering (RET 3325)	AS/ES	5	3/1	Energy saving and energy efficiency in heat power engineering and heat technology, Energy efficiency and energy audit of energy enterprises	Pre diploma practice	Providing training in the field of economics and organization of heat and power production, which allows future specialists to navigate technical and economic information, use economic principles, laws and methods to effectively solve technological problems, principles and methods of organization, production, production processes that arise in the process of engineering activities.

It is recommended by the Methodological Commission of the Department of the academic quality Council of the Technical 21.06.2024 y. protocol №16

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