NCJSC «S. Seifullin Kazakh Agrotechnical Research University»

APPROVED
S. Seifullin Kazakh Agrotechnical Research University
Dean of the Energy Faculty
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«06» _____ 2024 y.

CATALOG OF ELECTIVE DISCIPLINES
according to the educational program 7M07101 «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 master's degree programs **7M07101 «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	Gas turbine units for oil and gas transportation (GUDTNG 5229)	BS/ES	5	1/1	Steam and gas turbines	Master student's research work, including implementation of master's thesis	Formation of basic knowledge on GTU maintenance technologies in accordance with the requirements of regulatory and technical documentation. Skills of planning and organization of maintenance, works on carrying out scheduled preventive maintenance of gas turbine units, organization of inspections of technical condition and industrial safety expertise, evaluation of operational reliability of gas turbine installations are being developed.
2	Features and prospects for the development of heat and gas supply in the agro-industrial complex (OPRTA 5229)	BS/ES	5	1/1	Thermal power systems and energy use	Master student's research work, including implementation of master's thesis	Formation of undergraduate competencies in: the area of features and prospects of heat and gas supply in the agro-industrial complex, in the production of agricultural food and livestock breeding; a new management psychology focused on resource and energy conservation; waste disposal and environmental protection. Familiarization of students with the concept of creating waste-free and low-waste production and features of resource-saving technologies based on agricultural waste.
3	Approximate methods for solving thermal engineering problems (PMRTZ 5312)	AS/ES	5	1/1	Operation of heating equipment	Methods of extim energysaving	Formation of undergraduates' in-depth knowledge of methods for solving heat engineering problems, the use of computer technologies, methods of modeling and optimization of heat power and heat technology processes, installations and systems. Mastering methods and techniques of analog, physical and mathematical modeling of processes, apparatuses and systems of heat power engineering and heat technology, skills of conducting a computational experiment.

4	Technological methods to reduce the formation of harmful emissions at thermal power plants (TMSOVVT 5322)	AS/ES	5	1/1	Implementation of technological processes and environmental technologies at thermal power plants	Methods of extim energysaving	Formation of undergraduates: a clear understanding of the principles of environmental engineering policy, properties and interaction of the environment with industrial production; knowledge of the basics of operation and adjustment of various types of environmental devices; skills in choosing the most environmentally efficient construction of a heat engineering process, developing an effective way to suppress the formation of harmful substances and methods for cleaning emissions from thermal power plants.
5	Ways of development of low-power boilers (PRKMM 5336)	AS/ES	4	1/2	Boiler plants and steam generators	Master student's research work, including implementation of master's thesis	The study of the principles of operation of the designs of modern low-power boilers, the processes occurring in them, promising directions for the development of small boiler construction. Acquisition of skills: performing heat engineering, hydraulic and aerodynamic calculations of low-power boiler units; operation of low-power boiler units, commissioning and research work; development and optimization of technological schemes for the production of thermal energy.
6	Designs of furnace-burner devices for heat supply of buildings and structures (KTGUDTZS 5336)	AS/ES	4	1/2	Boiler plants and steam generators	Master student's research work, including implementation of master's thesis	Training of a specialist in the field of fuel combustion methods in the furnaces of boilers intended for heat supply of buildings and structures. Familiarization with modern methods of combustion of gaseous, liquid and solid fuels with the greatest efficiency, with the methodology for calculating burner devices depending on the type and characteristics of the fuel being burned.
7	Systems of technical water supply of thermal power plants (STV 5228)	BS/ES	5	1/2	Technological bases of preparation of the water and fuel at thermal power plants and industrial enterprises	Physical and chemical modeling of heat engineering processes	The purpose of teaching the discipline is the formation of students' competencies in the design and operation of water supply systems for thermal power plants and nuclear power plants, which determine the energy efficiency, safety

							and efficiency of power plants. Course content: the course covers the types of water supply systems, issues of organization and operation. Ways of modernization of technical water supply systems in order to increase the efficiency of the stations.
8	Methods of protection of equipment from corrosion (MZOOK 5228)	BS/ES	5	1/2	Corrosion and conservation of energy equipment	Physical and chemical modeling of heat engineering processes	Knowledge is being formed about: the mechanisms of corrosion, its impact on the engineering infrastructure of cities; methods and methods of reducing and preventing corrosion; the use of modern materials, equipment, devices, technologies; improving the operation of protection systems. Skills are being developed: determination of characteristics and parameters of corrosion processes; calculation of corrosion protection of systems; application of basic means of protection of engineering systems and equipment from corrosion
9	Production of secondary fuels from waste (PVTPPO 6318)	AS/ES	5	2/1	Alternative renewable energy sources	Master student's research work, including implementation of master's thesis	Formation of knowledge about the methods of handling industrial, household waste, secondary raw materials and fuel resources. Acquaintance with the technological reasons for the formation of waste and harmful emissions. Mastery of skills: development of proposals for the introduction of new equipment and technologies and their technological and economic justification; calculation and analysis of resource and energy saving as a result of their implementation.
10	Production waste plants at thermal power stations (OOPCT 6320)	AS/ES	5	2/1	Implementation of technological processes and environmental technologies at thermal power plants	Master student's research work, including implementation of master's thesis	Familiarization of students with: waste generation processes of thermal power plants; types of waste entering the environment, their physical and chemical characteristics; indicators of their energy and environmental impact; technologies for capturing solid particles from flue gases; methodology of system-structural

							analysis, which examines trends and alternatives for the development of waste-free energy production and all processes of interaction of thermal power plants with the environment.
11	Energy-efficient enclosing structures (EOK 6335)	AS/ES	5	2/1	Calculation of efficiency in thermal power engineering	Research practice	Formation of in-depth knowledge: in the field of heat and mass transfer; about the current level of development of enclosing structures of buildings and structures; about the theory of the state and transfer of moisture in building materials; about the laws of humidification of enclosing structures; about the main directions of energy conservation in improving the enclosing structures of buildings due to the possible full consideration of physical factors acting in enclosing structures.
12	Heat transfer calculations in enclosing structures (RTOK 6335)	AS/ES	5	2/1	Calculation of efficiency in thermal power engineering	Research practice	The purpose of mastering the discipline is: to obtain in-depth information about the current level of knowledge in the field of heat and mass transfer in building envelopes, about the theory of the state and moisture transfer in building materials, about the laws of moistening building envelopes, about the main directions of energy saving when improving building envelopes due to full accounting physical factors.
13	Physical and chemical modeling of heat engineering processes (FHMTP 6227)	BS/ES	5	2/1	Physical and chemical methods of preparation of water	Research practice	Formation of the ability of students to apply the basic laws of natural science disciplines, methods of physical and chemical modeling for making design decisions in their professional activities, in order to simulate processes, devices, systems and methods in the field of power engineering.
14	High temperature processes and installations (VPU 6230)	BS/ES	5	2/1	Theoretical foundations of thermal power plants	Research practice	Formation of in-depth knowledge of the characteristics, principles of operation, features of operation of high-temperature installations. Development of skills of practical application of the principles of organization of high-temperature

							technological processes, determination of parameters of individual stages of processes in heat-technological reactors, work with structural diagrams of high-temperature heat-technological installations.

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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