NJSC SHAKARIM UNIVERSITY OF SEMEY

EDUCATIONAL PROGRAM

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

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

0710
(Code in the International Standard Classifcation of Education)

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

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

Bachelor
(Level of preparation)

Semey

Educational program

6B07 - Engineering, Manufacturing and Civil engineering
(Code and classification of the field of education)

6B071 - Engineering and engineering trades
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bachelor
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Semey 2023

PREFACE

Developed

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

Members of the Academic Committee	Full name	Academic degree, academic title, position	Signature
Head of the Academic Committee	Нұрымхан Гүлнұр Несіптайқызы	Dean of the Faculty of Engineering and Technology	
Educational program manager	Хажидинова Акбота Рыспековна	Acting Associate Professor of the Department of "Technical Physics and Heat Power Engineering	
Member of the AC	Степанова Ольга Александровна	Head of the Department of "Technical Physics and Heat Power Engineering	
Member of the AC	Умыржан Темирлан Нурланулы	senior lecturer of the Department of "Technical Physics and Heat Power Engineering	
Member of the AC	Демин Николай Александрович	Deputy Director of the State-Owned Enterprise "Teplokommunenergo"	
Member of the AC	Тастанбеков Медет Женисович	Thermal engineer of the Baikal branch of the National Nuclear Center of the Republic of Kazakhstan	
Member of the AC	Арчаков Илья Дмитриевич	student of the TE - 002 group of the Educational Program 6B07103 - Heat Power Engineering	
Member of the AC	Касемканов Дастан Нурланулы	student of the TE - 002 group of the Educational Program 6B07103 - Heat Power Engineering	

Reviewing

Full name of the reviewer	Position, place of work	Signature
Кузкенов Алмас Салакиденович	Head of the Thermal Power Plant - 1 of the State -Owned Enterprise Teplokommunenergo of the city of Semey	

Reviewed

at the meeting of the Quality Assurance Commission of the Faculty of Engineering and Technology
Recommended for approval by the Academic Council of the University
Protocol № 4.6 "10" April 2023
Chairman of the Commission on Quality Assurance Abdilova G.

Approved at the meeting of the Academic Council of the University Protocol No. 8 "25" April 2023.

Approved

at the meeting of the Academic Council of the University
Protocol № 1 "01" of September 2023
Chairman of the Academic Council of the University Orynbekov D.R.

Content

1.Introduction

1.1.General data

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

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

1.2.Completion criteria

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

1.3.Typical study duration: 4 years

2.PASSPORT OF THE EDUCATIONAL PROGRAM

2.1.EP purpose	The training of graduates with extensive knowledge, whose activities include research, design, construction and operation of technical means for the production of heat, its application, management of its flow and the conversion of other types of energy into heat, implementing these processes.
2.2.Map of the training profile within the educational program	
Code and classification of the field of education	6B07 - Engineering, Manufacturing and Civil engineering
Code and classification of the direction of training	6B071 - Engineering and engineering trades
Code in the International Standard Classification of Education	0710
Code and classification of the educational program group	B062 - Electrical engineering and power engineering
Code and name of the educational program	6B07103 - Power Engineering
2.3.Qualification characteristics of the graduate	
Degree awarded / qualification	Bachelor of Engineering and Technology under the educational program «6B07103 - Heat power engineering»
Name of the profession / list of positions of a specialist	Can occupy primary positions: laboratory engineer, engineer of research, design and design organizations without presenting requirements for the work experience of a category 1 technician and other positions without presenting requirements for work experience in accordance with qualification requirements
OQF qualification level (industry qualification framework)	6
Area of professional activity	Industry, energy industry, education, science
Object of professional activity	Enterprises and firms of energy and technological profiles in the field of energy supply of industrial enterprises. Research institutions. Higher and secondary specialized educational institutions.
Types of professional activity	Design and engineering Production and technological Research Installation and commissioning Organizational and managerial
Graduate Model	Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society. Apply methods for calculating and selecting equipment for energy systems, ventilation and air conditioning systems based on the latest achievements of science and technology Apply basic knowledge in the feld of mathematics and natural sciences, methods of mathematical analysis and modeling, theoretical and experimental research in the feld of energy in cognitive and professional activities. To apply in educational, scientifc and professional

	activities the requirements for the graduate of the educational program of the rules, requirements and norms for the preparation of documentation. Use the fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology. Operate knowledge in the feld of electrical engineering, measuring instruments, automation and information technology in their subject area Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the feld of energy Describe the principles of operation and conduct of heat engineering calculations of developed and used heat power and heat technology installations and systems. Perform calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the terms of reference. Calculate and regulate energy production and distribution systems.

3.Modules and content of the educational program

Module 1. Fundamentals of social and humanitarian knowledge

Foreign language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	27632 (3012976)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The content of the discipline «Foreign language» assumes the formation of students` intercultural and communicative competencies at B1 level. The discipline is aimed at mastering the knowledge, skills and abilities that allow using a foreign language in interpersonal communication and professional activity. All types of speech activity are taught, such as reading, writing, listening and production of texts of level complexity with a certain degree of grammatical and lexical correctness.

Purpose of studying of the discipline

Formation of intercultural and communicative competence of students in the process of foreign language education at a sufficient level (A2, pan-European competence) and the level of basic sufficiency (B1, pan-European competence). Depending on the level of training, the student at the time of completion of the course reaches the B1 level of the pan-European competence if the language level of the student at the start is higher than the A2 level of the pan-European competence.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Prerequisites

School course

Postrequisites

Foreign language

Kazakh language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	27643 (3012979)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at deepening the acquired knowledge of students in the framework of the school curriculum, as well as the use of language and speech means based on a full understanding of vocabulary and grammatical system of knowledge; the formation of socio-humanitarian worldview of students within the framework of the national idea of spiritual revival; free expression of mobile thought as a means of speech communication and in the process of communication; awareness of the national culture of the people, the ability to distinguish features of national cognition.

Purpose of studying of the discipline

Forms through phraseological units the recognition of national culture, its meaning as a linguistic unit related to spiritual culture; skills of identifying facts of national and cultural significance in the formation of Kazakh phraseology.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Prerequisites

School course

Postrequisites

Kazakh language

Bases of economics, law and ecological knowledge

Discipline cycle	General educational disciplines

Discipline component	University component
SubjectID	28170 (3013157)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The integrated discipline includes the main issues and principles in the field of fundamentals of law and anti- corruption culture, economics, entrepreneurship and leadership, ecology and life safety. Features of the use of regulatory legal acts, the ability to use the business, ethical, social, economic, entrepreneurial and environmental standards of society. Specifics of environmental-legal, economic, entrepreneurial relations, leadership qualities and principles of combating corruption.

Purpose of studying of the discipline

It consists in studying the basic patterns of the functioning of living organisms, the biosphere as a whole and the mechanisms of their sustainable development under the conditions of anthropogenic impact and emergency situations; in understanding the concept of corruption, the legitimacy of the fight against it, the content of the state penal policy; in the formation of students` basic fundamental stable knowledge on the basics of economic theory, in instilling the skills and abilities of economic thinking; in introducing students to the theory and practice of entrepreneurship, to the basics of creating their own business; in the formation of theoretical knowledge and practical skills for the development and improvement of leadership qualities.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Russian language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	28183 (3012980)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is intended for the development of the language personality of the student, who is able to carry out cognitive and communicative activities in Russian in the areas of interpersonal, social, professional, intercultural communication; for teaching students practical mastery of the Russian language in various areas of communication and various situations, mastering the specifics of functional semantic types and genres of functional styles of speech, enriching the vocabulary with special vocabulary, forming and improving the skills of monologue and dialogic speech.

Purpose of studying of the discipline

The purpose of the program is to form the socio-humanitarian worldview of students in the context of the national idea of spiritual modernization, involving the development on the basis of national consciousness and cultural code of the qualities of internationalism, tolerant attitude to world cultures and languages as translators of world-class knowledge, advanced modern technologies, the use and transfer of which can ensure the modernization of the country and personal career growth of future specialists.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Prerequisites

School course

Postrequisites

Russian language

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	28187 (3012982)

Course	1
Term	1
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline
It provides for the joint cooperation of a teacher and a student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline, preparing students for participation in mass sports competitions; forms motivational and value attitudes towards physical culture and the need for systematic physical exercises and sports; gives basic knowledge about the use of physical culture and sports in the development of vital physical qualities.

Purpose of studying of the discipline
The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

Learning Outcomes
ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Prerequisites
School course

Postrequisites
Physical Culture

Kazakh language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	28198 (3012978)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at expanding language literacy, free communication with the environment and mental and ideological skills of the student, understanding the role of language in the process of mastering world- class knowledge through the formation of a future specialist`s worldview based on national consciousness and cultural code, improving the knowledge of the state language by future specialists, increasing the scope of use of the Kazakh language by specialists.

Purpose of studying of the discipline
Ensuring high- quality mastery of the Kazakh language as a means of social, intercultural, professional communication through the formation of communicative competencies at all levels of language use.

Learning Outcomes

Prerequisites
Kazakh language

Postrequisites
Basic and profile disciplines of the EP

Foreign language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	28197 (3012977)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The content of the discipline «Foreign language» assumes the formation of students`linguo- cultural, socio- cultural, cognitive and communicative competencies at B2 level. The discipline is aimed at deep and extended study of productive and receptive language material. As a result, the student must be able to understand all types of speech activity in accordance with the requirements of B2 level

and master the subject content of the discipline and speech.

Purpose of studying of the discipline

Formation of linguo- culturological, socio- cultural, cognitive and communicative competence of students in the process of foreign language education at the B2 level, pan-European competence. Depending on the level of training, the student at the time of completing the course reaches the level B2 of the pan-European competence, if the language level of the student at the start is higher than the level B1 of the pan-European competence.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Prerequisites

Foreign language

Postrequisites

Basic and profile disciplines of the EP Information and communication technology

History of Kazakhstan

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	28196 (3013062)
Course	1
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Qualification examination

Short description of discipline

The main stages of the history of Kazakhstan are studied with: nomadic statehood, Turkic civilization, the era of colonialism, the Soviet period, independence. The driving forces, trends, patterns of historical development are analyzed; problems: ethnogenesis of the Kazakh people, the formation of statehood, national liberation movements, demographic development. The skills of analyzing historical events and facts, working with historical literature are being formed.

Purpose of studying of the discipline

The purpose of the discipline is to provide objective knowledge about the main stages of the development of the history of Kazakhstan from ancient times to the present.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Prerequisites

School course

Postrequisites

Philosophy

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

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	28200 (3013155)
Course	1
Term	2
Credits count	8
Lections	30hours
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	55hours
Independent work of the student	110hours
Total	240hours
Knowledge control form	Examination

Short description of discipline

The module of socio-political knowledge involves the study of four scientific disciplines – sociology, political science, cultural studies, psychology, each of which has its own subject, terminology and research methods. Interactions between these scientific disciplines are carried out on the basis of the principles of information complementarity; integrativity; methodological integrity of research approaches of these disciplines; generality of the methodology of learning, result-oriented; unified system representation of the typology of learning outcomes as formed abilities.

Purpose of studying of the discipline

Formation of social and humanitarian worldview of students in the context of solving the problems of modernization of public consciousness, defined by the state program "Looking into the Future: Modernization of Public Consciousness".

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Prerequisites

School course

Postrequisites

Philosophy

Russian language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	28199 (3012981)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is intended for the development of the language personality of the student, who is able to carry out cognitive and communicative activities in Russian in the areas of interpersonal, social, professional, intercultural communication; to teach the scientific style of speech as a language of specialty, the creation of secondary texts, the formation of skills for the production of oral and written speech in accordance with the communicative goal and the professional sphere of communication, instilling the skills of speech etiquette, business rhetoric.

Purpose of studying of the discipline

The purpose of the program is to form the socio-humanitarian worldview of students in the context of the national idea of spiritual modernization, involving the development on the basis of national consciousness and cultural code of the qualities of internationalism, tolerant attitude to world cultures and languages as translators of world-class knowledge, advanced modern technologies, the use and transfer of which can ensure the modernization of the country and personal career growth of future specialists.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Prerequisites

Russian language

Postrequisites

Basic and profile disciplines of the EP

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	28202 (3012983)
Course	1
Term	2
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline

It provides for the joint cooperation of a teacher and a student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline, the ability to exercise control and self-control in the process of classes, gaining knowledge on health promotion, hardening and increasing the body`s resistance to the effects of adverse factors of labor activity, mastering methods of selection of physical exercises and sports.

Purpose of studying of the discipline

The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Prerequisites

Physical Culture

Postrequisites

Physical Culture

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	28222 (3012985)
Course	2
Term	1
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline

Provides for the joint cooperation of the teacher and the student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline; increasing the level of physical fitness and developing physical qualities; mastering the technique of sports; education of discipline, collectivism, comradely mutual assistance; education of mental stability, development and improvement of basic motor qualities - endurance, strength, speed, dexterity, flexibility.

Purpose of studying of the discipline

The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Prerequisites

Physical Culture

Postrequisites

Physical Culture

World of Abai

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	28205 (3013059)
Course	2
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at studying historical facts, the philosophical and artistic foundations of the works of Abay Kunanbaev, Shakarim Kudaiberdiev, which form worldview and aesthetic values, the student`s ability to express his opinion, practical skills and perception of such human qualities as morality, honesty, artistic character. The genius of the writers of Kazakh literature and the role of M. Auezov in the study and popularization of Abai`s heritage, the significance of his works for history, literature and science are determined.

Purpose of studying of the discipline

Formation of the meaning of philosophical and ideological being, understanding of the problems raised in the works of Abai Kunanbayuly, Shakarim Kudaiberdiuly, Mukhtar Auezov and application of the acquired knowledge in the practice of everyday life.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Prerequisites

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

Postrequisites

Basic and profile disciplines of the EP

Information and communication technology

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	28269 (3013156)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours

Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at mastering the conceptual foundations of the architecture of computer systems, operating systems and networks by students; formation of the ability to critically understand the role and signifcance of modern information and communication technologies in the era of digital globalization, new "digital" thinking, knowledge about the concepts of developing network and web applications, skills in using modern information and communication technologies in various felds of professional activity, scientifc and practical work, for self-educational and other purposes.

Purpose of studying of the discipline
Formation of the ability to critically evaluate and analyze processes, methods of searching, storing and processing information, methods of collecting and transmitting information through digital technologies

Learning Outcomes
ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Prerequisites
School course Foreign language

Postrequisites
Basic and profile disciplines of the EP

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	28309 (3012984)
Course	2
Term	2
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline
Provides for the joint cooperation of the teacher and the student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline; acquisition of versatile abilities and skills for the development of physical abilities, socio-cultural experience and socio-cultural values of physical culture and sports; development of communication skills, thinking, self-development, the formation of experience in the implementation of sports and recreational and training programs.

Purpose of studying of the discipline
The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

Learning Outcomes
ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Prerequisites
Physical Culture

Postrequisites
Basic and profile disciplines of the EP

Philosophy

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	28312 (3013044)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at developing students` openness of consciousness, understanding their own national code and self-consciousness, spiritual modernization, competitiveness, realism and pragmatism, independent critical thinking, the cult of knowledge and education, a holistic view of philosophy as a special form of understanding the world, mastering key worldview concepts, as well as

the development and strengthening of the values of tolerance, intercultural dialogue and a culture of peace.

Purpose of studying of the discipline

Formation in students of a holistic view of philosophy as a special form of knowledge of the world, its main sections, problems and methods of studying them in the context of future professional activities.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Prerequisites

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

Postrequisites

Basic and profile disciplines of the EP

Module 10. Efficiency of energy systems and their feasibility study

Economics of enterprise

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	28414 (3013060)
Course	4
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

At the present stage of economic reforms, significant changes are taking place in the economy, especially at the microeconomic level: the nature and methods of economic activity of enterprises are changing. This course studies in detail the resources of the enterprise, the efficiency of their use, profitability and the main technical and economic indicators of the functioning of the enterprise. In addition, methods of stimulating labor resources, in order to optimize the production capacity and capital of the enterprise.

Purpose of studying of the discipline

The purpose of studying the discipline "Enterprise Economics" is to develop students` economic thinking based on the study of the economic mechanism of the enterprise in market conditions, providing deep theoretical knowledge and practical experience in the field of economics and organization of the enterprise and the use of technological equipment.

Learning Outcomes

ON9 Perform calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the terms of reference.

Prerequisites

Bases of economics, law and ecological knowledge

Postrequisites

Final examination

Undergraduate practice

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28417 (3012973)
Course	4
Term	2
Credits count	15
Undergraduate practice	450hours
Total	450hours
Knowledge control form	Total mark on practice

Short description of discipline

Undergraduate practice is a purposeful and active work of the student to collect the necessary materials for the completion of the graduation project, obtaining and consolidating the skills of design and technological design. The final stage of preparing a student for the implementation and defense of a graduation project using the experience and knowledge gained in the course of studying theoretical courses and passing industrial practices, with the fulfillment of the goals and objectives.

Purpose of studying of the discipline

Improving the quality of training students by mastering the methods and techniques of processing the material collected during the internship for writing and defending a graduation project.

Learning Outcomes

ON9 Perform calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the terms of reference.

Prerequisites

Manufacturing practice II

Postrequisites
Final examination

Manufacturing practice III

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28418 (3013063)
Course	4
Term	2
Credits count	15
Working practice	450hours
Total	450hours
Knowledge control form	Total mark on practice

Short description of discipline
Consolidation of knowledge and skills in production- technological, organizational- management, installation and commissioning, calculation and design, experimental and research activities acquired in the study of major disciplines and internships. Formation in students of the ability and readiness to perform professional functions at energy enterprises, in research organizations, for analytical and innovative activities in the professional field, corresponding to the educational program «Heat power engineering».

Purpose of studying of the discipline
Consolidation and deepening of the theoretical knowledge gained in the process of studying at the university, the implementation of the adaptive capabilities of the student to new working conditions, as well as the development of skills and mastery of professional knowledge.

Learning Outcomes
ON9 Perform calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the terms of reference.

Prerequisites
Manufacturing practice II

Postrequisites
Final examination

Module 2. Natural sciences

Mathematics

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	28168 (3012989)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The purpose of this course is to provide students with fundamental training in mathematics. The course is aimed at forming a sufficiently high culture of mathematical thinking among students and developing the ability to creatively approach problem solving. In addition to studying the fundamental foundations of higher mathematics (elements of analytical geometry, linear algebra, mathematical analysis, differential equations), the course assumes consideration of various applications of mathematics to solving production problems from the field of professional specialization.

Purpose of studying of the discipline
creation of the basis for the development of logical thinking and mathematical culture. Formation of basic knowledge and acquisition of basic skills of using mathematical apparatus for solving theoretical and applied problems, as well as the necessary level of mathematical training for mastering other applied disciplines studied within a specific profile; skills of working with special mathematical literature

Learning Outcomes
ON3 Apply basic knowledge in the field of mathematics and natural sciences, methods of mathematical analysis and modeling, theoretical and experimental research in the field of energy in cognitive and professional activities.

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Physics

Discipline cycle	Basic disciplines
Discipline component	University component

SubjectID	28169 (3012988)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
In process of studying this discipline, students get acquainted with the basic laws, concepts of all sections of physics. Physics is an area of experimental science, performing laboratory work and tasks, students are convinced of unity of the theory and practice of experiments. Students have the opportunity to gain knowledge on the subject in any area of their specialty.

Purpose of studying of the discipline
Formation of ideas about the role of experimental and theoretical methods of cognition of the surrounding world, development of skills for independent solving of physical problems, motivation to study modern scientific literature.

Learning Outcomes
ON3 Apply basic knowledge in the field of mathematics and natural sciences, methods of mathematical analysis and modeling, theoretical and experimental research in the field of energy in cognitive and professional activities.

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Chemistry

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	28218 (3013061)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at studying the basic concepts and laws of chemistry, classical and quantum-mechanical ideas about the structure of the atom and chemical bonds; consideration of periodic laws and structure of the periodic system of chemical elements, types of chemical bonds; mastering the laws of thermodynamics, chemical kinetics and chemical equilibrium, corrosion of metals, ways of expressing the concentration of solutions; promote the ability to apply the knowledge gained in practice, to solve problems in professional training.

Purpose of studying of the discipline
Familiarization of students with modern ideas about the structure of substances, with the basic theories of chemical processes, with the properties of catalytic and complex systems, as well as with the properties of elements. Knowledge of the basic theory of chemical processes necessary in the study and deeper understanding of all subsequent special disciplines, also give students scientific and practical training in the basics of analytical chemistry.

Learning Outcomes
ON3 Apply basic knowledge in the field of mathematics and natural sciences, methods of mathematical analysis and modeling, theoretical and experimental research in the field of energy in cognitive and professional activities.

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

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

Introduction to the specialty

Discipline cycle	Basic disciplines
Discipline component	Electives

SubjectID	27650 (3012990)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
This discipline introduces students to the Law on Education and Science of the Republic of Kazakhstan, the structure of higher education. Studying this course, the student receives the first concept of the educational program Thermal power engineering, namely: the Law on Energy Saving, energy in the national economy, energy resources, fuel, basic equipment of thermal power systems, non-traditional renewable energy sources, thermal and nuclear power plants, boiler plants, nuclear energy.

Purpose of studying of the discipline
The study of the discipline «Introduction to the specialty» is necessary to familiarize students with their future profession and encourage them to master the necessary knowledge and skills, as well as to familiarize students with the specifics of university education and the graduating department.

Learning Outcomes
ON4 To apply in educational, scientific and professional activities the requirements for the graduate of the educational program of the rules, requirements and norms for the preparation of documentation.

Prerequisites
School course

Postrequisites
Thermodynamic fundamentals cycles of thermal power plants

The history of the development of thermal power engineering

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28186 (3012992)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
This course describes in detail the methodology of the historical foundations of the development of technology and science. The questions about the need for the emergence of qualitatively new technical objects with their historical and technical prerequisites are summarized. The following are studied in more detail: thermal power facilities and installations, turbines of steam engines, cycles of steam power plants, internal combustion engines, gas turbine plants, nuclear- heat power and refrigeration plants.

Purpose of studying of the discipline
The acquisition by students of knowledge about the future profession, the dynamics of its development and prospects for the future. Professional orientation of the student, developing an understanding of the importance of the profession and the high importance of energy as a strategic industry, on which not only the economic well-being of the country, but its political position in the world depends.

Learning Outcomes
ON4 To apply in educational, scientific and professional activities the requirements for the graduate of the educational program of the rules, requirements and norms for the preparation of documentation.

Prerequisites
School course

Postrequisites
Thermodynamic fundamentals cycles of thermal power plants

Fundamentals of thermal power engineering

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28185 (3012991)
Course	1
Term	1
Credits count	3
Lections	15hours

Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
The discipline forms students` concepts of the fuel and energy complex of the Republic of Kazakhstan with its features. Introduces the basics of combined production of electricity and thermal energy, thermodynamic cycles and schemes of power plants. The course is also devoted to the study of heat transfer issues, sources of heat production in district heating, alternative energy, prospects for the development of nuclear energy, the use of fuel and methods of its combustion.

Purpose of studying of the discipline
The purpose of the discipline is to prepare students to study the basic heat and power terminology and definitions, to show the importance and seriousness of the future specialty, to awaken interest in the chosen profession and the desire to work thoughtfully on its development.

Learning Outcomes
ON4 To apply in educational, scientific and professional activities the requirements for the graduate of the educational program of the rules, requirements and norms for the preparation of documentation.

Prerequisites
School course

Postrequisites
Thermodynamic fundamentals cycles of thermal power plants

Application of USDD standards in the design of engineering documentation.

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	28201 (3013046)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at developing students` knowledge and skills of state standards in the field of text and engineering documentation, the rules for the design of text and scientific and technical documentation in accordance with general state standards, the design of drawings in accordance with USDD, the basics of descriptive geometry modeled in modern graphic systems. Skills of 3D modeling technologies in the interfaces of automatic design systems (CAD).

Purpose of studying of the discipline
Discipline is necessary for acquiring the skills and knowledge to make and read special drawings, as well as for the development of spatial imagination. Building Knowledge
images, design of text documentation, rules for drawing up and designing drawings. Graphic skills are widely used in the development of projects for thermal power and heat technology facilities.

Learning Outcomes
ON4 To apply in educational, scientific and professional activities the requirements for the graduate of the educational program of the rules, requirements and norms for the preparation of documentation.

Prerequisites
School course

Postrequisites
Elements of machine graphics and CAD basics in thermal power engineering

Educational practice

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	28203 (3013058)
Course	1
Term	2
Credits count	2
Study practics	60hours
Total	60hours
Knowledge control form	Total mark on practice

Short description of discipline
Educational practice is a part of the educational activity of students, which is aimed at obtaining primary, professional knowledge, consolidating and deepening the theoretical knowledge gained in educational program «Heat power engineering», as well as mastering

the necessary skills and abilities in the chosen specialty: skills research activities, business correspondence skills and work in accordance with the specialty of study. A broader idea of future professional activity.

Purpose of studying of the discipline

To study the issues of production, transmission and distribution of energy at a particular enterprise, to get acquainted with the main equipment of the enterprise - the basis of practice. Get the first idea about your specialty and possible places of your employment after graduation.

Learning Outcomes

ON4 To apply in educational, scientific and professional activities the requirements for the graduate of the educational program of the rules, requirements and norms for the preparation of documentation.

Prerequisites

Introduction to the specialty

Postrequisites

Manufacturing practice I

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

Theoretical and applied mechanics

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	28219 (3012993)
Course	2
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

The basic concepts and definitions of theoretical and applied mechanics are stated. The discipline includes the study of the main sections: theoretical mechanics (torque, trajectory and acceleration of the movement of a point, solid bodies, the concept of friction, the dynamics of the rotational motion of a body); resistance of materials (stress, deformation, compression, stretching, bending); theory of mechanisms and machines (basics of machines and mechanisms); machine parts (characteristics, types, calculation of axles, shafts, couplings).

Purpose of studying of the discipline

To form a system of knowledge about the laws of statics, kinematics and dynamics of mechanical systems, methods for calculating the parameters of their movement and interaction; methods for calculating the parameters of stress-deformed state of structures and parts; Develop practical skills in assessing the strength, rigidity and stability of structural elements and parts; To study the general issues of theory and calculation of parts of general application, which are widely used in engineering and technology; Develop practical skills in using methods for calculating elements of technological equipment, parts of machines and mechanisms according to performance and reliability criteria.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology.

Prerequisites

Physics

Postrequisites

Fluid and gas mechanics

Theoretical basics of heat engineering

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28212 (3012995)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This discipline is devoted to the study of the basic laws of thermodynamics and heat and mass transfer. The basic concepts and

definitions are considered as: thermal parameters, ideal and real gases, thermodynamic process, water and steam, parameters of the working fluid, thermal radiation, heat transfer, heat transfer, thermal conductivity, convection, similarity theory, Fourier and Newton-Richmann laws, as well as heat exchangers and thermodynamic cycles of processes and installations.

Purpose of studying of the discipline

The purpose of the course is to give students extensive knowledge about the basic principles and laws of thermodynamics, modern methods for analyzing and calculating thermodynamic processes and cycles of thermal power plants, about fundamental laws and methods for analyzing and calculating heat and mass transfer processes, to develop practical skills in determining the characteristics of heat and mass transfer processes of heat power and heat technology installations and systems

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology.

Prerequisites

Physics

Postrequisites

Heat and mass transfer

Heat engineering

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28214 (3012996)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline «Heat engineering» is aimed at studying the main sections of thermodynamics and heat and mass transfer. The following are presented for study: laws of thermodynamics, thermodynamic processes, the concept of "moist air" and "thermodynamic diagram", gas mixtures and the laws of ideal gases, methods of heat transfer (thermal conduction, convection, thermal radiation), heat transfer, heat and energy, similarity theory, classification and cycles of heat engines , features of the theory of fuel combustion (solid, liquid, gaseous).

Purpose of studying of the discipline

The purpose of the discipline «Heat engineering» is the development by students of the fundamental laws of thermodynamics and heat transfer, the mutual transformation of heat and work, the study of the theory of heat engines, refrigeration machines and steam generators, as well as its practical applications in solving problems of heat power engineering.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology.

Prerequisites

Physics

Postrequisites

Heat and mass transfer

Thermodynamics and heat transfer

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28215 (3012997)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course of the discipline outlines the basics of technical thermodynamics and heat transfer. The basic concepts and definitions in the study of the discipline include: thermodynamic processes, thermodynamic diagrams and tables, thermal conductivity - stationary, non-stationary and their processes, heat transfer, convection, fluid flow, heat transfer, heat exchangers and installations. Methods for

calculating thermodynamic processes and cycles of heat power and refrigeration plants are presented.

Purpose of studying of the discipline

The purpose of teaching the discipline is: the development of the basic laws of thermodynamics, the study of thermodynamic processes of reversible and irreversible stationary and non-stationary. Basic thermodynamic processes in ideal gases. The study of thermodynamic cycles of various processes and systems, principles of operation and design features of heat and steam generators, heat transformers, refrigerators and refrigerators, heat exchangers and devices, heat and mass transfer processes occurring in various types of thermal installations.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology.

Prerequisites

Physics

Postrequisites

Heat and mass transfer

Heat and mass transfer

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28270 (3013057)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This discipline is aimed at studying the basic concepts of heat and mass transfer and considering the physical meaning of the processes of mass and heat transfer in space and time. The issues of stationary and non-stationary heat conduction, heat transfer by radiation, convective heat transfer, similarity of heat transfer phenomena, heat transfer processes during phase transformations, liquid and gaseous media, the law of conservation of mass and energy are studied. Thermal calculations of heat exchangers are made.

Purpose of studying of the discipline

The purpose of the discipline is to master the methods for performing calculations of the main processes of heat and mass transfer: heat conduction in structural elements, heat and mass transfer with free and forced convection, two-phase heat and mass transfer, radiative heat and mass transfer, learn how to calculate heat and mass transfer apparatuses and apply heat transfer intensification methods.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology.

Prerequisites

Theoretical basics of heat engineering

Postrequisites

Air conditioning and refrigeration

Technical thermodynamics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28299 (3013002)
Course	2
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

When studying this discipline, the basic laws of thermodynamic processes and systems are considered. The basic concepts of technical thermodynamics, the laws and methods of thermodynamics, the conditions of thermodynamic equilibrium, phase transformations, the cycles of gas turbine, steam turbine installations of thermal and nuclear power plants, as well as the cycles of refrigeration machines are described. The main thermodynamic processes of ideal and real gases, their graphic representation in T-s, h-s diagrams are considered.

Purpose of studying of the discipline

Training of specialists in the field of application of thermodynamic methods for the analysis of physical and chemical phenomena,

modern methods of analysis and calculation of thermodynamic processes and cycles

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology.

Prerequisites

Introduction to the specialty

Postrequisites

Heat pumps

Fluid and gas mechanics

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	28275 (3012994)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at studying the laws of mechanics, the basic physical properties of liquids and gases. The study of the laws of hydrodynamics, hydrostatics, gas dynamics. Kinematics and fluid dynamics. Laminar and turbulent outflow of liquids. Bernoulli`s equation, Newton`s law Fundamentals of hydrodynamic similarity. Pipelines and hydraulic calculation of pipelines. The design and purpose of various hydraulic machines, hydraulic drives are outlined. The main processes occurring in hydraulic machines are described.

Purpose of studying of the discipline

Obtaining theoretical knowledge by students in the field of fluid and gas mechanics, hydraulic machines and other devices for processing and moving gaseous liquids, mastering methods for solving applied problems necessary for further study of special disciplines and practical activities in the specialty.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology.

Prerequisites

Physics

Postrequisites

The turbines of thermal and nuclear power stations

Heat and mass transfer processes and apparatuses thermotehnologi

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28271 (3012998)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is devoted to familiarizing students with heat technology devices, processes and systems. Ideas about the processes of mass and heat transfer during heat transfer, as well as during drying, rectification and evaporation. Performing calculations of heat and mass transfer processes and devices for industrial use. Mathematical models of heat and mass transfer processes of heat-technological and heat-engineering devices and installations, models of flow and heat transfer in devices and drying chambers are studied.

Purpose of studying of the discipline

The purpose of this discipline is to study the physical processes and principles of operation of various types of heat exchange, evaporator, drying, refrigeration and other heat and mass transfer equipment used in the energy sector of a modern industrial enterprise, methods for their calculation and design, characteristic modes and technical and economic indicators of their work.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology.

Prerequisites

Theoretical basics of heat engineering

Postrequisites

Air conditioning and refrigeration

Heat and mass transfer in power plants

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28273 (3012999)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The main sections studying the physical foundations of the processes of mass and heat transfer are presented for the study of the discipline, the basics of heat transfer are outlined: the processes of stationary and non-stationary heat conduction, convective heat transfer, diffusion, boiling, condensation, heat transfer by radiation. The features of heat transfer processes under different operating modes of power plants are considered. It also outlines the principles of engineering methods for thermal and hydraulic calculations of power and nuclear installations, heat exchangers, steam generators.

Purpose of studying of the discipline

The purpose of the discipline is to study the processes of heat and mass transfer occurring in the elements of modern heat and power devices and installations. Substantiation of the choice of optimal operating modes and design of heat engineering devices.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology.

Prerequisites

Theoretical basics of heat engineering

Postrequisites

Air conditioning and refrigeration

Thermal energy systems and energy use

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28298 (3013001)
Course	2
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is devoted to the study of the main issues of production of thermal and electrical energy, thermal power schemes for various purposes, systems for the production and distribution of energy carriers of industrial enterprises. The main energy characteristics of material and thermal balances of heat technological processes and installations are given. Heat supply systems are described. The problems and prospects for the development of the country`s energy sector and its components are reflected. Particular attention is paid to the issues of energy saving and energy efficiency of processes and industries.

Purpose of studying of the discipline

The purpose of studying the discipline is to form students` ideas about the current state and prospects for the development of the main heat and power processes and systems; In studying the essence of physical processes occurring in heat and power systems and mastering the methods of heat engineering calculations. Design of industrial heat and power systems, evaluation of the effectiveness of energy and energy saving programs.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology.

Prerequisites

Introduction to the specialty

Postrequisites

Heat pumps

Thermodynamic fundamentals cycles of thermal power plants

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28296 (3013000)
Course	2
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This discipline is aimed at studying the basics of thermodynamics. Application of the laws of thermodynamics for the calculation of processes and cycles of thermal power plants. The thermodynamic properties of substances and working fluids such as ideal and real gases, water vapor are described. Reference and tabular data on the thermodynamic properties of these substances are given. The thermodynamic cycles of power plants are considered: gas-turbine, steam-turbine and combined-cycle.

Purpose of studying of the discipline
The purpose of the discipline is: the study of the laws of conservation and transformation of energy, in relation to systems of transfer and transformation of heat. Studying the basics of thermodynamic analysis of work processes in heat-power, heat-pump and refrigeration machines and methods for analyzing their energy efficiency.

Learning Outcomes
ON5 Use the fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology.

Prerequisites
Introduction to the specialty

Postrequisites
Heat pumps

Theoretical foundations of refrigeration technology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28341 (3013048)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Thermodynamic concepts, definitions and laws of the fundamentals of refrigeration engineering are given. The thermodynamic principles of operation of refrigerating machines and installations are stated. The physical phenomena and processes used to obtain low temperatures and the cooling effect are considered. The main thermodynamic processes, the classification of refrigerating machines and installations are studied. The problems of choosing rational methods for calculating and analyzing low-temperature thermodynamic cycles are solved.

Purpose of studying of the discipline
The purpose of mastering the discipline is to form and specify theoretical knowledge on the basics of obtaining low temperatures and to prepare future specialists for independent thermodynamic analysis and calculation of work processes in low-temperature installations.

Learning Outcomes
ON2 Apply methods for calculating and selecting equipment for energy systems, ventilation and air conditioning systems based on the latest achievements of science and technology
ON5 Use the fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology.

Prerequisites
Thermodynamic fundamentals cycles of thermal power plants

Postrequisites
Superchargers and heat engines

Refrigeration technology

Discipline cycle	Basic disciplines
Discipline component	Electives

SubjectID	28344 (3013050)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at studying the fundamental theories of refrigeration engineering, the basics of thermodynamics, methods of production and consumption of low temperatures, as well as artificial cold, direct, reversible and irreversible cycles, properties of cycles of refrigeration machines, installations and refrigerants. The choice and method of calculation of refrigeration equipment are substantiated. The methods of design, installation and technical operation of refrigerating machines and installations are given.

Purpose of studying of the discipline

The objectives of mastering the discipline are in-depth training in the field of processes and apparatus for the production of artificial cold, the formation of knowledge about the basics of thermodynamic calculation and analysis of the operation of refrigeration machines and their individual elements, the training of specialists for professional activities in the field of design and construction, operation and maintenance of low-temperature heat exchangers installations.

Learning Outcomes

ON2 Apply methods for calculating and selecting equipment for energy systems, ventilation and air conditioning systems based on the latest achievements of science and technology
ON5 Use the fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology.

Prerequisites

Thermodynamic fundamentals cycles of thermal power plants

Postrequisites

Superchargers and heat engines

Refrigeration machines

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28345 (3013049)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The basis of this discipline is the devices and principles of operation of refrigeration machines. In the course of studying the discipline, the student must have knowledge about: the basics of thermodynamic work and the working substances of refrigeration machines, the types and classification of refrigeration machines, heat exchangers and the design of auxiliary equipment. Study images of circuit diagrams and thermal diagrams for refrigerants. Perform refrigerant cycle calculations.

Purpose of studying of the discipline

The purpose of mastering the discipline is to study and acquire practical skills in the design and calculation of refrigeration systems and installations from the conditions of reliability, safety, efficiency of their operation. Development of the ability to investigate and test refrigeration units and apparatuses in the process of their creation and operation, as well as the ability to analyze their activities and the information received. The study of the discipline provides for familiarization of students with the industrial production of artificial cold, its rational use for the implementation of technological processes and maintaining optimal temperatures in storage and refrigeration chambers.

Learning Outcomes

ON2 Apply methods for calculating and selecting equipment for energy systems, ventilation and air conditioning systems based on the latest achievements of science and technology
ON5 Use the fundamental laws of mechanics, thermodynamics and heat and mass transfer and their practical applications in solving problems of heat power engineering and heat technology.

Prerequisites

Thermodynamic fundamentals cycles of thermal power plants

Postrequisites

Superchargers and heat engines

Module 5. Automation and Information technology

Computer technologies in thermal power engineering

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28217 (3013004)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course «Computer technologies in thermal power engineering» is aimed at studying methods for modeling thermal engineering, thermal power processes, systems and installations using computer technology. Methods of mathematical, physical modeling of processes and systems of heat power and heat technology objects are studied, which are accompanied by a computational experiment. The use of computer technology (software products) and computer technology to select acceptable options for systems and installations of heat power.

Purpose of studying of the discipline

Formation of the student`s knowledge, abilities and skills in the use of computer technology in the calculations of heat and power processes, as well as the use of modern computer-aided design systems in heat and power processes.

Learning Outcomes

ON6 Operate knowledge in the field of electrical engineering, measuring instruments, automation and information technology in their subject area.

Prerequisites

Application of USDD standards in the design of engineering documentation.

Postrequisites

Final examination

Theoretical foundations of electrical engineering

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28208 (3013006)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course belongs to the engineering disciplines. The main questions of the theory of linear electrical and non-linear electrical circuits, methods for calculating currents, voltages under constant and other influences are considered. Theories of digital, analog and analytical signals and their conversion, generalized formulas for methods for calculating transients, three- phase electrical circuits and their calculation, basic provisions about electric motors are also considered.

Purpose of studying of the discipline

The purpose of studying the discipline is to teach students to apply the laws of electromagnetism and the theory of electrical circuits for the correct mathematical description and theoretical study of the processes occurring in various electrical devices and complex systems.

Learning Outcomes

ON6 Operate knowledge in the field of electrical engineering, measuring instruments, automation and information technology in their subject area.

Prerequisites

Physics

Postrequisites

Thermal and nuclear power stations

Electrical engineering and electronics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28207 (3013005)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course of discipline consists of two sections: electrical engineering and electronics. The study of the discipline is based on the theory and practical application of linear, non- linear electrical circuits of direct and alternating current, electrical signals, electrical devices and measurements, the basics of digital electronics in modern production processes and control systems. Various physical quantities characterizing electromagnetic phenomena are also considered.

Purpose of studying of the discipline
The purpose of mastering the discipline is to study by students the basic patterns of processes occurring in electromagnetic and electronic circuits and methods for determining electrical quantities that characterize these processes, the acquisition of theoretical and practical knowledge on the basics of electrical engineering and electronics, necessary for the successful development of subsequent disciplines of the specialty.

Learning Outcomes
ON6 Operate knowledge in the field of electrical engineering, measuring instruments, automation and information technology in their subject area.

Prerequisites
Physics

Postrequisites
Thermal and nuclear power stations

Electrical engineering, electronics and electric drive

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28209 (3013007)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
In this course of the discipline, the main issues related to the study of magnetic and electrical circuits are considered. Describes digital elements and devices, methods of synthesis and analysis of electronic circuits, electrical instruments and measurements, electronic devices and instruments, as well as electric motors and apparatus. The constructions and principles of operation of electric machines of direct and alternating currents are considered.

Purpose of studying of the discipline
Formation of the ability to use the basic laws and laws of electrical engineering, electronics, and electric drive. Master the methods of calculating and studying the characteristics of electrical circuits, electrical machines, electronic devices, skills in using reference literature, selecting and operating electrical, electromechanical and electronic devices.

Learning Outcomes
ON6 Operate knowledge in the field of electrical engineering, measuring instruments, automation and information technology in their subject area.

Prerequisites
Physics

Postrequisites
Thermal and nuclear power stations

Elements of machine graphics and CAD basics in thermal power engineering

Discipline cycle	Basic disciplines
Discipline component	Electives

SubjectID	28216 (3013003)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Studying the discipline «Elements of computer graphics and CAD in power bases», the student develops knowledge and skills of the basics of engineering design. Modern methods of building computer-aided design systems for power facilities and installations are being studied. Practical skills are characterized by the use of a number of software packages MathCAD, MathLab and AutoCAD, for performing technical calculations and modeling heat power facilities.

Purpose of studying of the discipline
Formation of the student`s knowledge, abilities and skills in the use of modern computer-aided design systems in heat and power processes

Learning Outcomes
ON6 Operate knowledge in the field of electrical engineering, measuring instruments, automation and information technology in their subject area.

Prerequisites
Application of USDD standards in the design of engineering documentation.

Postrequisites
Final examination

Automation of turbine plants

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28353 (3013008)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course is aimed at studying the design and construction of steam turbines, the principle of their operation, automation of production processes of turbine units. Possible advantages and disadvantages of automation of auxiliary steam turbine installations are considered. The formulation and ways of solving the problem of building automated control systems of turbine units, approaches that provide reliable protection of the automation system of the turbine unit with minimal financial costs are determined.

Purpose of studying of the discipline
The objectives of mastering the discipline: the formation of students` skills and abilities in the operation of automation of the main equipment of thermal power plants; formation of knowledge about the forms of mathematical description of the steady-state operating modes of turbine plants, methods for setting initial information, algorithms for solving optimization problems

Learning Outcomes
ON6 Operate knowledge in the field of electrical engineering, measuring instruments, automation and information technology in their subject area.

Prerequisites
Electrical engineering and electronics

Postrequisites
Final examination

Automation of the power equipment of thermal and nuclear power plants

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28352 (3013009)
Course	3
Term	2
Credits count	5

Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course is aimed at studying control systems that perform the functions of automatic monitoring of current data of the operation of thermal power equipment, automatic sound signal about the state of the main and auxiliary equipment of power plants, automatic operation of equipment protection against possible damage during their operation. The possibilities of remote control of the technological process, switching on or off the regulators in a certain sequence, the feasibility of using automation in the operation of thermal power plants are considered.

Purpose of studying of the discipline
Formation of basic knowledge and skills in the field of automation of heat and power processes. Formation of knowledge by modern technical means of automation used for the introduction of technological processes of thermal and nuclear power plants, industrial enterprises. Work with automatic measurement control systems and their analysis.

Learning Outcomes
ON6 Operate knowledge in the field of electrical engineering, measuring instruments, automation and information technology in their subject area.

Prerequisites
Electrical engineering and electronics

Postrequisites
Final examination

Dosimetric instruments

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28374 (3013056)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline describes the types and principles of operation of devices for measuring ionizing radiation, dose rates of radioactive substances, volumes and masses of samples of radioactive substances. The purpose of studying the discipline is to form students` knowledge about the nature of the occurrence of ionizing radiation, radionuclides, radiation safety and protection measures. And also in the ability to apply measurement methods and conditions for safe work with radiation sources.

Purpose of studying of the discipline
Training students in the field of methods and means of quantitative measurement of ionizing radiation, ensuring radiation safety of humans and the environment, organization of radiation and radioecological safety services.

Learning Outcomes
ON6 Operate knowledge in the field of electrical engineering, measuring instruments, automation and information technology in their subject area.

Prerequisites
Electrical engineering and electronics

Postrequisites
TPP operation and safety precautions

Means of accounting and control in the thermal power industry

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28373 (3013055)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours

Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Discipline «Means of accounting and control in power» - the use of measuring and auxiliary devices for measuring temperature, pressure, flow rate of liquid, gas, steam. Accounting and control of electrical and thermal energy to the consumer for more efficient use of energy resources. The use of digital instruments and digital computers for accounting and control of measuring instruments in thermal power facilities.

Purpose of studying of the discipline
The study of measurements of thermal parameters, familiarization with the main types of instruments and information- measuring systems in the operation of power plants.

Learning Outcomes
ON6 Operate knowledge in the field of electrical engineering, measuring instruments, automation and information technology in their subject area.

Prerequisites
Electrical engineering and electronics

Postrequisites
TPP operation and safety precautions

Technical instruments and measurements in thermal power engineering

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28372 (3013054)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course of the discipline provides general information about the measurements used in thermal power engineering and thermal technology. The principles of operation and features of modern devices and means for measuring temperature, pressure, quantity and consumption of substances are considered. Methods for conducting modern measurements in thermal and nuclear power plants are given. As well as measuring the microclimate of residential and public buildings for heating, ventilation and air conditioning systems.

Purpose of studying of the discipline
The objectives of the study of the discipline - is to form a general idea, to master the methods and modern technical means for measuring thermal parameters, methods and technical means for monitoring the composition and quality of technological environments in thermal power engineering.

Learning Outcomes
ON6 Operate knowledge in the field of electrical engineering, measuring instruments, automation and information technology in their subject area.

Prerequisites
Electrical engineering and electronics

Postrequisites
TPP operation and safety precautions

Module 6. Innovative technologies of engineering and heat technologies

High temperature materials and coverings

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28317 (3013011)
Course	3
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours

Total	150hours
Knowledge control form	Examination

Short description of discipline
This course discusses modern methods of obtaining high-temperature materials and coatings that improve their performance. The dependences of the mechanical properties of high-temperature materials and coatings on their microstructure are studied, the sections of physics devoted to the strength, plasticity and destruction of materials are studied. The methods of structural analysis of materials and new technologies of their construction, which are most widely used at the present time, are considered.

Purpose of studying of the discipline
The objectives of the discipline are aimed at acquaintance and study of new generation materials; obtaining new promising materials; structure and properties of materials used in the thermal power industry.

Learning Outcomes
ON7 Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the field of energy.

Prerequisites
Heat and mass transfer

Postrequisites
Heat pumps

Air conditioning and refrigeration

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28316 (3013010)
Course	3
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course examines the principles of creating and automatically maintaining the required values of humidity, temperature and air velocity in the premises, ensuring an optimal microclimate of air-conditioned rooms. The work of technical means of air extraction, filtration, humidification, heating, cooling and cleaning is described. The systematization of knowledge and skills in the field of air conditioning and refrigeration processes of industrial and residential premises is carried out.

Purpose of studying of the discipline
The purpose of studying the discipline is to acquire theoretical knowledge and practical skills in calculating, designing and operating modern air conditioning systems in buildings and structures for various purposes with minimal energy and environmental impact on the environment.

Learning Outcomes
ON2 Apply methods for calculating and selecting equipment for energy systems, ventilation and air conditioning systems based on the latest achievements of science and technology
ON7 Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the field of energy.

Prerequisites
Heat and mass transfer

Postrequisites
Heat pumps

Design of turbine plants

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28351 (3013016)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course is devoted to the study of the design of industrial turbine installations, their classification and principles of operation. The

general rules for the design of turbine units and installations are considered, attention is paid to the choice of parameters of the working fluid, the main parts of turbines. The thermal calculation of the steam turbine is carried out. The degree of reactivity and its effect on the efficiency of the turbine plant, the output power of electric energy generation are studied.

Purpose of studying of the discipline

The purpose of mastering the discipline is to prepare the student to carry out design, research, operational, installation, commissioning and repair activities in the field of turbine installations of thermal and nuclear power plants.

Learning Outcomes

ON7 Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the field of energy.

Prerequisites

Thermodynamic fundamentals cycles of thermal power plants

Postrequisites

Final examination

Heat pumps

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28350 (3013015)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course examines existing projects and prospects for the use of heat pumps in various sectors of the economy. Information is provided on the basic general principles of operation of heat pumps, ways to increase their energy efficiency. The possibilities of using heat pump installations in heat supply systems of large cities and regions are being studied. The description of concrete examples of implemented projects on the introduction of heat pumps in the production process is given.

Purpose of studying of the discipline

The purpose of mastering the discipline is the formation of knowledge, skills and abilities necessary in professional activities in the field of energy saving in technological processes of production carried out using heat pump installations. The study of the main designs of heat pumps, methods of calculation and design of heat pump installations used in thermal power engineering.

Learning Outcomes

ON2 Apply methods for calculating and selecting equipment for energy systems, ventilation and air conditioning systems based on the latest achievements of science and technology
ON7 Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the field of energy.

Prerequisites

Thermodynamic fundamentals cycles of thermal power plants

Postrequisites

Final examination

Energy saving in industrial enterprises

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28377 (3013017)
Course	4
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at studying the methods of energy saving in industrial heat and power enterprises. The main types and stages of energy inspections (energy audit) are considered.
Attention is paid to energy efficiency and rational use of fuel and energy resources. Typical energy-saving measures implemented to improve the energy efficiency of industrial enterprises are being studied. An assessment is given of modern energy-saving technologies using information and communication technologies in energy saving.

Purpose of studying of the discipline

Obtaining knowledge on the basics of conducting an energy audit of industrial enterprises and housing and communal services,

compiling an energy passport for a consumer of energy resources, and introducing standard energy-saving measures.

Learning Outcomes

ON7 Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the field of energy.

Prerequisites

Automation of the power equipment of thermal and nuclear power plants

Postrequisites

Final examination

Basics of nature

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28379 (3013019)
Course	4
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course is aimed at studying the basics of nature management. The types, forms and mechanisms of rational nature management are considered. Ways of rational use of natural resources are being studied, as well as the concept of sustainable development of mankind and the problems of nature management. Attention is paid to the conservation, restoration and rational change of the ecological balance of natural systems. The sustainable development of energy and ecology is being studied in order to rationally improve nature management.

Purpose of studying of the discipline

Formation of theoretical and practical foundations for rational nature management and mechanisms for its implementation, systematic information about natural conditions and resources, the features of their use, reproduction and protection.

Learning Outcomes

ON7 Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the field of energy.

Prerequisites

Automation of the power equipment of thermal and nuclear power plants

Postrequisites

Final examination

Modern methods of energy conversion (in english)

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28403 (3013012)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course is devoted to the study of modern thermal (thermodynamic), photovoltaic and photochemical methods of converting various energy sources. The advantages and disadvantages of each of the methods of energy conversion are discussed. The expediency of their application is determined depending on the specific source of energy production. Attention is paid to the issue of improving the efficiency of modern power plants running on organic fuel and unconventional sources of energy.

Purpose of studying of the discipline

The purpose of the discipline is: the study and application of modern, promising ways of converting energy, technologies for the production of thermal and electrical energy.

Learning Outcomes

ON7 Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the field of energy.

Prerequisites

Foreign language Introduction to the specialty

Postrequisites

Final examination

Modern methods of energy conversion (in russian)

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28404 (3013013)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course is aimed at studying modern methods and methods of converting various types of energy. The course describes the classification of forms and types of energy, pays attention to improving the designs of thermal power plants and the principles of their operation. Magnetohydrodynamic generators, Faraday`s laws, energy conservation, electromagnetic induction are considered. The principles of operation of organic solar cells based on planar heterojunction are studied.

Purpose of studying of the discipline
The purpose of the discipline is to acquire knowledge on the current state and general problems of energy in the development of the heat and power industry.

Learning Outcomes
ON7 Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the field of energy.

Prerequisites
Foreign language Introduction to the specialty

Postrequisites
Final examination

Energy in Kazakhstan

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28405 (3013014)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course examines the energy sector of the Republic of Kazakhstan, the state and prospects of the country`s energy development. Attention is paid to the development of renewable energy sources and nuclear energy. The key factors of production and transmission of electric energy in Kazakhstan are considered. The electric energy market, energy-producing and energy-supplying organizations and operators are being studied. The issues of energy development based on the creation, consolidation and unification of energy systems are being studied.

Purpose of studying of the discipline
The purpose of this course is to analyze the state of the energy industry in Kazakhstan, as well as to monitor the development of the fuel and energy complex of the country as a whole.

Learning Outcomes
ON7 Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the field of energy.

Prerequisites
Foreign language Introduction to the specialty

Postrequisites
Final examination

Energy saving in heat power engineering and heat technology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28376 (3013018)
Course	4
Term	1
Credits count	5
Lections	30hours

Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course is devoted to an overview of the existing problems and the main trends in the development of modern domestic and global energy. The issues of energy saving and energy efficiency in the production of electric and thermal energy are considered. Modern methods and technologies that significantly reduce the anthropogenic impact of heat-generating enterprises on the environment are being studied. Laws and programs in the Republic of Kazakhstan and measures for their implementation are being studied.

Purpose of studying of the discipline
Formation of knowledge, skills and abilities for energy saving in the fuel and energy complex, industries, transport, agro-industrial complex, public utilities and the use of non-traditional renewable energy sources.

Learning Outcomes
ON7 Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the field of energy.

Prerequisites
Automation of the power equipment of thermal and nuclear power plants

Postrequisites
Final examination

Alternative and renewable energy sources

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28406 (3013051)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course examines the current state of the fuel and energy complex of the Republic of Kazakhstan, as well as the technology for the production of electrical and thermal energy based on non-traditional and renewable energy sources. The features of the use of renewable energy sources are studied. Attention is paid to the current state of the use of non-traditional and renewable energy sources, with the problems and prospects for the development of these areas in the thermal power industry.

Purpose of studying of the discipline
Formation of general principles for the use of non-traditional and renewable energy sources in solving problems of energy use in heat technology production.

Learning Outcomes
ON7 Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the field of energy.

Prerequisites
Introduction to the specialty

Postrequisites
Final examination

Basics of alternative energy

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28408 (3013052)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course examines the current state and prospects for the development of non-traditional energy in the fuel and energy balance. The principles of operation and design of power plants using non-traditional types of energy are described. The main modes of operation of non-traditional energy sources are studied, as well as the principles and practical use in thermal power engineering.

Attention is paid to modern methods and possibilities of using waste and biomass as sources of electrical and thermal energy.

Purpose of studying of the discipline

The purpose of mastering the discipline is to form knowledge on the current state and use of non-traditional and renewable energy sources, their energy, economic and environmental characteristics.

Learning Outcomes

ON7 Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the field of energy.

Prerequisites

Introduction to the specialty

Postrequisites

Final examination

Theoretical Foundations of spectrometry

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28409 (3013053)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Studying this discipline, students develop the following knowledge and skills: the concepts of spectrometry and its theoretical foundations, the basic principles of the spectrometry method. Methods of ionization of volatile and nonvolatile substances, liquids and gases, electron ionization of substances in liquid and gas phases are studied. Classification of ionization methods. Charged particles of electric and magnetic fields. Mass spectrometry and mass analyzers.

Purpose of studying of the discipline

The purpose of mastering the discipline is to form the foundations of deep knowledge in the field of various spectrometric methods. Development of students` competencies, allowing them to carry out professional activities in the future, by mastering the theoretical and experimental foundations of the most important methods of spectrometry.

Learning Outcomes

ON7 Apply theoretical and practical knowledge necessary for the use of innovative technologies and techniques in the field of energy.

Prerequisites

Introduction to the specialty

Postrequisites

Final examination

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

Manufacturing practice I

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	28310 (3012974)
Course	2
Term	2
Credits count	5
Working practice	150hours
Total	150hours
Knowledge control form	Total mark on practice

Short description of discipline

Manufacturing practice I of students is an opportunity for real, practical acquisition and development of initial professional skills, knowledge and skills at specialized (according to the educational program) enterprises. Comparison of their expectations and the realities of future professional activity. Acquisition of knowledge and skills necessary for the development of general technical and special disciplines, future specialty and professional work. Acquaintance with the real practical work of the enterprise.

Purpose of studying of the discipline

The purpose of the practice is to increase the level of training of students, familiarize them with the future profession and inculcate certain primary skills.

Learning Outcomes

ON8 Describe the principles of operation and conduct of heat engineering calculations of developed and used heat power and heat technology installations and systems.

Prerequisites

Educational practice

Postrequisites
Manufacturing practice II

Special questions fuel combustion

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28306 (3013020)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course is aimed at studying the thermal characteristics of fossil fuels, as well as methods of preparing fuel for combustion in boiler furnaces. The main technological schemes and the design of the elements of the fuel preparation and fuel supply system are studied. Methods for determining the heat balance of a boiler unit are considered. The description of the main methods of burning solid fuel and the design of burners in thermal power plants is given.

Purpose of studying of the discipline
Training of specialists in the field of fuel combustion methods in the furnaces of power boilers of industrial enterprises, familiarization with modern methods of burning gaseous, liquid and solid fuels with maximum efficiency, selection and calculation of combustible devices depending on the type and characteristics of combustible fuel.

Learning Outcomes
ON8 Describe the principles of operation and conduct of heat engineering calculations of developed and used heat power and heat technology installations and systems.

Prerequisites
Theoretical basics of heat engineering

Postrequisites
Energy saving in heat power engineering and heat technology

Gas turbines and GTP

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28308 (3013021)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course discusses the basic concepts of gas turbine installations operating at thermal power plants. The description of the basic scheme and principles of operation of gas turbine plants is given.
Operating modes and basic structural elements are studied gas turbine plants related to the main equipment of thermal power plants. The determination of the main parameters and modes of gas turbine plants is being studied. Attention is paid to thermal and strength calculations of heat engines.

Purpose of studying of the discipline
The purpose of studying the discipline is to study the fundamentals of the theory of gas turbine installations, the features of their designs and the composition of thermal circuits. Analysis of methods for increasing the efficiency of gas turbine installations.

Learning Outcomes
ON8 Describe the principles of operation and conduct of heat engineering calculations of developed and used heat power and heat technology installations and systems.

Prerequisites
Theoretical basics of heat engineering

Postrequisites
Energy saving in heat power engineering and heat technology

Boiler installations and steam generators

Discipline cycle	Profiling discipline
Discipline component	Electives

SubjectID	28319 (3013022)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline is aimed at studying boiler plants and steam generators of thermal power plants. Information is provided on the main equipment of boiler plants, ways to improve their heat and power efficiency in general. The efficiency of heat exchange processes in solid fuel boiler elements is studied. The main processes of fuel preparation for boiler plants are described. Thermal schemes are studied, as well as the characteristics and designs of boilers of thermal power plants.

Purpose of studying of the discipline

The purpose of studying the discipline is to acquire knowledge about the types and designs of steam, hot water and steam boilers, about the organization of combustion of organic fuels in boiler furnaces, about thermophysical and hydro-gas-dynamic processes occurring in the gas-air and steam-water paths of a boiler plant, about the operating conditions of heating surfaces.

Learning Outcomes

ON8 Describe the principles of operation and conduct of heat engineering calculations of developed and used heat power and heat technology installations and systems.

Prerequisites

Theoretical basics of heat engineering

Postrequisites

The thermal network

Installation and operation of heat and power equipment

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28349 (3013024)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline

This discipline describes the basic provisions of the installation and operation of thermal power equipment and systems. The performance indicators and functions of thermal power systems are considered. The description and features of maintenance of thermal power equipment of CHPP are given. The work of cogeneration turbines is studied according to thermal and electrical load curves, as well as the features of operation modes of turbines with backpressure, industrial and cogeneration controlled steam extractions.

Purpose of studying of the discipline

The purpose of the discipline is the study of the regulatory framework, materials, equipment and technology for the installation and operation of thermal power plants.

Learning Outcomes

ON8 Describe the principles of operation and conduct of heat engineering calculations of developed and used heat power and heat technology installations and systems.

Prerequisites

Theoretical basics of heat engineering

Postrequisites

The thermal network

Power boilers and low-capacity boiler plants

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28320 (3013023)
Course	3
Term	1
Credits count	5

Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline
This course deals with power boilers and low-capacity boiler plants used in industrial enterprises and thermal power plants. The main elements and designs of power boilers and low-capacity boiler plants are described. The efficiency of heat transfer processes in the heating surfaces of boiler units is studied. The description of thermal schemes of drum boilers with natural and forced circulation is given.

Purpose of studying of the discipline
The purpose of mastering the discipline: The study of structures, physical principles of operation, processes in gas and working environments, calculation and design, characteristics, basics of operation and industrial application of boiler plants.

Learning Outcomes
ON8 Describe the principles of operation and conduct of heat engineering calculations of developed and used heat power and heat technology installations and systems.

Prerequisites
Theoretical basics of heat engineering

Postrequisites
The thermal network

Physico-chemical methods of water preparation

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28365 (3013025)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course is aimed at studying the basic qualities of natural waters and physical and chemical methods of water preparation. Technological indicators of water quality and circulation in the operating cycle of a thermal power plant are considered. The main classifications of ways and methods of water treatment are described. Attention is paid to the main methods of removing corrosive gases and impurities from water in order to implement reliable optimal conditions for the water-chemical regime of thermal power plants.

Purpose of studying of the discipline
The purpose of studying the discipline is to form students` knowledge of the theoretical foundations of applied and promising physical and chemical methods of water treatment used in boiler houses, thermal power plants and other industrial facilities using water and steam as a heat carrier.

Learning Outcomes
ON8 Describe the principles of operation and conduct of heat engineering calculations of developed and used heat power and heat technology installations and systems.

Prerequisites
Chemistry

Postrequisites
The thermal network

Water conditioning

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28368 (3013026)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours

Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course is aimed at studying the characteristics and main indicators of water quality, as well as water treatment processes. The main stages of water purification methods are considered.
The types of coagulants and processes used in water coagulation are studied. Methods and principles of water quality analysis are described. The description of the main equipment and means of automation of water treatment plants is given. The basic concepts of the operation of water treatment equipment and water quality control are considered.

Purpose of studying of the discipline
The purpose of mastering the discipline is to study by students the technologies and processes for the treatment of natural and waste water for drinking water supply and the technological needs of industrial enterprises, mastering the principles and methods of water treatment and waste water treatment.

Learning Outcomes
ON8 Describe the principles of operation and conduct of heat engineering calculations of developed and used heat power and heat technology installations and systems.

Prerequisites
Chemistry

Postrequisites
The thermal network

Waste water treatment technology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28370 (3013027)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is devoted to the study of modern problems of wastewater pollution sources. Methods and technologies for wastewater treatment are being studied, such as: hydromechanical treatment; physical and chemical cleaning; biochemical and thermal purification. The basics of designing a technological scheme for wastewater treatment are given and studied. Modern wastewater treatment methods and technologies for their implementation and improvement are considered.

Purpose of studying of the discipline
The purpose of the discipline is to form students` theoretical knowledge of the physical and chemical foundations and technologies for treating natural and waste water and develop practical skills in choosing technological schemes for treating water of various compositions.

Learning Outcomes
ON8 Describe the principles of operation and conduct of heat engineering calculations of developed and used heat power and heat technology installations and systems.

Prerequisites
Chemistry

Postrequisites
The thermal network

Module 8. Typical calculation and design methods

Steam turbines

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28348 (3013029)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours

Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline
This discipline describes the purpose and principles of operation of steam turbine devices. The classification of steam turbines and turbogenerators, design features and their operation are considered. In mastering the discipline, students include methods for designing, operating and adjusting turbine equipment and their individual devices, methods for optimizing the operation mode of turbines, modeling processes and cycles in steam turbines.

Purpose of studying of the discipline
Formation of basic information on the entire range of issues related to the principle of operation of steam turbines, their varieties, the design of parts and assemblies of turbine plants and thermal processes occurring in them.

Learning Outcomes
ON9 Perform calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the terms of reference.

Prerequisites
Theoretical and applied mechanics

Postrequisites
Final examination

The turbines of thermal and nuclear power stations

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28347 (3013028)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline
The content of the discipline outlines the basic concepts of steam and gas turbines. Classifications and types of turbines, as well as features of their operation are given. Technologies and methods of energy conversion at thermal and nuclear power plants and their efficiency are considered. The values of principal thermal diagrams and thermal diagrams of power units are described. Methodical bases and examples of calculation of thermal and design calculation of turbines are given.

Purpose of studying of the discipline
The purpose of the discipline: Mastering the theory, designs, design practice, conditions and modes of operation of power turbomachines of thermal and nuclear power plants, understanding the relationship between the operation of steam and gas turbines and technological processes in the equipment of thermal circuits of power units for various purposes.

Learning Outcomes
ON9 Perform calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the terms of reference.

Prerequisites
Theoretical and applied mechanics

Postrequisites
Final examination

Manufacturing practice II

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	28375 (3012975)
Course	3
Term	2
Credits count	5
Working practice II	150hours
Total	150hours
Knowledge control form	Total mark on practice

Short description of discipline
This type of practice is aimed at deepening the students` professional experience, developing general and professional competencies. Expansion and consolidation of professional knowledge, and the formation of skills for independent work. Possession of the main technological processes at energy enterprises. Practical study of design, technology and organization of production processes, gaining experience in managing and organizing work in the structural divisions of heat generating enterprises.

Purpose of studying of the discipline
The purpose of the practice is to study the processes and equipment of the organization of production, the rules of technical operation,

the rules for the construction of heat engineering installations and safety regulations.

Learning Outcomes

ON9 Perform calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the terms of reference.

Prerequisites

Manufacturing practice I

Postrequisites

Undergraduate practice Manufacturing practice III

Hydraulic machine

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28362 (3013032)
Course	3
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course is devoted to the study of the basic laws of hydraulics, hydrodynamics, the laws and nature of the flow of liquids and gases. The devices, structures, principles of operation and methods of operation of various hydraulic machines, hydraulic drives are considered. Methods for calculating and determining the main parameters and technological modes of operation of hydraulic machines are given. Descriptions of the principles of constructing mathematical and physical models of hydraulic processes are given.

Purpose of studying of the discipline

Formation of students` system of professional knowledge, skills and practical skills for highly efficient operation, quality service and further improvement of hydraulic machines and equipment used in the energy sector.

Learning Outcomes

ON2 Apply methods for calculating and selecting equipment for energy systems, ventilation and air conditioning systems based on the latest achievements of science and technology

ON9 Perform calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the terms of reference.

Prerequisites

Fluid and gas mechanics

Postrequisites

Final examination

Compressors, fans and pumps

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28361 (3013031)
Course	3
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course of the discipline is studied on the basis of knowledge of the basic laws of theoretical mechanics, fluid and gas mechanics, thermodynamics, heat and mass transfer. The discipline course consists of main sections that describe the types, principles of operation and elements of compressors, fans, pumps. Structural elements and technological parameters of superchargers are considered. Methods and examples for calculating compressors, pumps and fans are also given.

Purpose of studying of the discipline

The purpose of mastering the discipline is to prepare the student to carry out design, research, operational, installation, commissioning and repair activities in the field of pumps, fans and compressors used in thermal and nuclear power plants.

Learning Outcomes

ON2 Apply methods for calculating and selecting equipment for energy systems, ventilation and air conditioning systems based on the latest achievements of science and technology

ON9 Perform calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the terms of reference.

Prerequisites
Fluid and gas mechanics
Postrequisites
Final examination

Superchargers and heat engines

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28356 (3013030)
Course	3
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline contains a description of the main types, designs and principles of operation of various types of superchargers and heat engines. Carrying out thermal, hydraulic and structural calculations of superchargers and heat engines. The study of the discipline also includes the concepts of efficiency of thermal engines, the issues of the basics of calculation and the principles of operation of steam and gas turbines, internal combustion engines, compressors, fans, pumps are considered.
Purpose of studying of the discipline
Study of the theoretical and technical foundations of the operation of various types of blowers and heat engines used in the heat and power industry, the features of their operation, the principles for choosing types of machines for specific energy systems that ensure high efficiency and reliability of installations.
Learning Outcomes
ON2 Apply methods for calculating and selecting equipment for energy systems, ventilation and air conditioning systems based on the latest achievements of science and technology
ON9 Perform calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the terms of reference.
Prerequisites
Fluid and gas mechanics
Postrequisites
Final examination

Thermal mechanical and auxiliary equipment of power plants

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28410 (3013033)
Course	4
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The main characteristics and principles of operation of thermal and nuclear power plants are considered. The issues of design and calculations, operation and classification of thermal mechanical and auxiliary equipment of thermal and nuclear power plants are outlined. Heat-exchange equipment and hydraulic processes occurring in them, thermodynamic cycles of steam turbine, gas turbine installations, and schematic diagrams of power plants are studied. Thermal and design calculations of the main and auxiliary equipment of power plants are carried out.
Purpose of studying of the discipline
Obtaining knowledge by students about the state and prospects for the development of thermal mechanical and auxiliary equipment, which ensures reliable, safe and economical operation of power plants.
Learning Outcomes
ON9 Perform calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the terms of reference.
Prerequisites
Thermal and nuclear power stations
Postrequisites
Final examination

Technological energy resources of enterprises

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28411 (3013034)
Course	4
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This training course of the discipline is aimed at studying the main methods of energy production and distribution systems, principles, structure and their functioning. Questions of fuel supply systems, water supply, air supply of industrial enterprises are being studied. The characteristics and calculations of the main and auxiliary equipment of these systems are given. The issues of operation of the main equipment at industrial enterprises are considered. A feasibility study is given for the used and designed schemes for the production and consumption of energy carriers.

Purpose of studying of the discipline

The purpose of teaching the discipline is to study the structure, theoretical and technical foundations and principles of functioning of the systems of production, transport and consumption of technological energy carriers.

Learning Outcomes

ON9 Perform calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the terms of reference.

Prerequisites

Thermal and nuclear power stations

Postrequisites

Final examination

Refrigeration units

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28413 (3013035)
Course	4
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The area of study of the discipline is refrigeration cryogenic equipment and technology. The discipline is aimed at studying the cooling processes occurring in the elements of refrigeration units. Cycles, schemes and layouts of refrigeration units. Classification of refrigeration units in various areas of their application. Thermal and constructive calculations of elements of refrigeration units. Calculation and selection of the main and auxiliary refrigeration equipment. Characteristics and types of refrigerants.

Purpose of studying of the discipline

The purpose of the discipline is the formation of students` systems of knowledge, skills and professional competencies in the field of device, operation, as well as operation and maintenance of a refrigeration unit.

Learning Outcomes

ON2 Apply methods for calculating and selecting equipment for energy systems, ventilation and air conditioning systems based on the latest achievements of science and technology

ON9 Perform calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the terms of reference.

Prerequisites

Thermal and nuclear power stations

Postrequisites

Final examination

Design and research activity

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	28416 (3013531)

Course	4
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
The course "Project activity" discusses the methodology of research and design work. The role of the course in the formation of the competence of the bachelor of the educational program "Heat power engineering" is given. The stages of preparation and development of the project are shown, the importance of the correct choice of the topic, its relevance and issues is noted. Requirements for the design of the project, the establishment of deadlines and stages of work are formulated. The order of work with sources and observance of copyright is presented.

Purpose of studying of the discipline
Formation of basic skills for the development and maintenance of individual and group projects

Learning Outcomes
ON4 To apply in educational, scientific and professional activities the requirements for the graduate of the educational program of the rules, requirements and norms for the preparation of documentation.
ON9 Perform calculations according to standard methods and design individual parts and assemblies using standard design automation tools in accordance with the terms of reference.

Prerequisites
Elements of machine graphics and CAD basics in thermal power engineering Boiler installations and steam generators Thermal and nuclear power stations Application of USDD standards in the design of engineering documentation.

Postrequisites
Final examination

Module 9. Energy production and distribution systems

Industrial heat and mass transfer processes and installation

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28314 (3013037)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline
The course of discipline «Industrial heat, mass transfer processes and installation» considers the basics of heat, mass transfer processes, apparatus and installations. Also, processes occurring in industrial equipment and installations of various types and purposes. Classifications and descriptions of apparatus and installation designs are presented. The basics of design and calculation of devices and installations of the technological industry, as well as an assessment of their technical and economic indicators are given.

Purpose of studying of the discipline
The study of physical processes and principles of operation of various types of heat exchange, evaporator, distillation, drying, refrigeration and other heat and mass transfer equipment used in the energy sector of a modern industrial enterprise, methods for their calculation and design, characteristic modes and technical and economic indicators of their work.

Learning Outcomes
ON10 Calculate and regulate energy production and distribution systems.

Prerequisites
Heat and mass transfer

Postrequisites
Thermal mechanical and auxiliary equipment of power plants

Thermal and nuclear power stations

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28313 (3013036)
Course	3
Term	1

Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline
This course introduces various types of thermal and nuclear power plants and their purpose. Technologies for the production of thermal, electrical energy at thermal, nuclear power plants are being studied. Classification of power plants. Structural thermal diagrams of thermal, nuclear power plants are given. The adoption of technical decisions in the design and operation of power plants is considered and justified. Evaluation of technical and economic indicators of the efficiency of power plants.

Purpose of studying of the discipline
Formation of knowledge in the field of general principles, structure and functioning of thermal power plants and nuclear power plants, setting and solving problems of energy use in heat engineering production.

Learning Outcomes
ON10 Calculate and regulate energy production and distribution systems.

Prerequisites
Heat and mass transfer

Postrequisites
Thermal mechanical and auxiliary equipment of power plants

Energye equipment NPI

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28315 (3013038)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline
The main content of the discipline is based on the study of types and designs of nuclear power plants. Devices, principles of operation of the main and auxiliary equipment of nuclear power plants are described. The basics of control systems and automation of nuclear power plants are given. Calculations are carried out for the design and selection of equipment, modeling of the processes of nuclear power plants. The issues of operation safety and efficiency of nuclear power plants are reflected.

Purpose of studying of the discipline
The purpose of the discipline «Energy equipment NEI» is to gain knowledge on the design, principles of operation and functional purpose of the main power equipment of nuclear power plants.

Learning Outcomes
ON10 Calculate and regulate energy production and distribution systems.

Prerequisites
Heat and mass transfer

Postrequisites
Thermal mechanical and auxiliary equipment of power plants

Principles of NPP safety assurance

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28396 (3013041)
Course	4
Term	1
Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline

When studying the discipline, the main issues of the principles of ensuring the safety of nuclear power plants are considered. Fundamentals of radiation, technical safety in the operation of power plants. Emergencies, the reason for their occurrence, methods of prevention and localization with modern protection systems. Normative and technical documentation on the organization of control, reliability, and safety of nuclear power plants are being studied. Methods for processing and disposal of nuclear waste.

Purpose of studying of the discipline

Formation of students` knowledge and skills of using the basics of radiation safety to ensure safe life, studying the regulatory documentation of the Republic of Kazakhstan in the field of the use of atomic energy.

Learning Outcomes

ON10 Calculate and regulate energy production and distribution systems.

Prerequisites

Bases of economics, law and ecological knowledge

Postrequisites

Final examination

The thermal network

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28399 (3013039)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline

The issues of heat supply systems for domestic and industrial consumers are considered. Thermal networks and their constructive components are studied. Laying of thermal networks: ground, underground, channel and channelless. Methods of hydraulic calculation of heat networks, calculation and selection of pipelines are given. Evaluation and elimination of heat losses in heat networks. The issues of thermal insulation of pipelines, selection and calculation of thermal insulation are also outlined.

Purpose of studying of the discipline

The purpose of the discipline: the study of the fundamentals of the theory of heating, design features of heating systems, methods of calculation, characteristics and modes of operation of heat supply systems, the study of the features of hydraulic and thermal calculations of heat networks, the choice of operating mode and operation of heat supply systems, as well as the choice of equipment for thermal and individual points.

Learning Outcomes

ON10 Calculate and regulate energy production and distribution systems.

Prerequisites

Thermodynamic fundamentals cycles of thermal power plants

Postrequisites

Final examination

Operation and technical service of turbine equipment

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28402 (3013040)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline «Operation and technical service of turbine equipment» deals with turbine equipment of thermal and nuclear power plants. The main issues on the type and design, operation and maintenance of turbine equipment are outlined. Particular attention is paid to the section - the main and auxiliary equipment of turbine installations, the mode of operation, control and protection systems for turbines, as well as the operation of instrumentation.

Purpose of studying of the discipline

The purpose of the discipline is to acquire knowledge about modern methods of maintenance and diagnostics of thermal power equipment, the formation of skills in mastering advanced technologies and technical means of monitoring and assessing the state of turbine equipment in its operation.

Learning Outcomes
ON10 Calculate and regulate energy production and distribution systems.
Prerequisites
Thermodynamic fundamentals cycles of thermal power plants
Postrequisites
Final examination

TPP operation and safety precautions

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28384 (3013042)
Course	4
Term	1
Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at studying and mastering the basic principles and modes of operation of thermal power plants. It describes the safe performance of work on the operation, repair, adjustment of thermal, mechanical and water treatment equipment, automation and measurement systems at thermal power plants and boiler houses. The safety rules for the operation of the main and auxiliary equipment of thermal power plants are described in more detail.
Purpose of studying of the discipline
It is the acquisition of knowledge on the basics of proper technical operation and methods of maintaining rational modes of operation of thermal power equipment of IES and CHPPs, ensuring safety, trouble-free operation and high efficiency of operation, rational passage of peaks and dips in electrical load and heat supply to consumers, taking into account the latest achievements of thermal power engineering in this area.
Learning Outcomes
ON10 Calculate and regulate energy production and distribution systems.
Prerequisites
Bases of economics, law and ecological knowledge
Postrequisites
Final examination

Energy life support systems and safety

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28389 (3013043)
Course	4
Term	1
Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the basic concepts of the energy system, the principles of operation and operation of energy systems that ensure the safe consumption of energy resources for life support. Methods for estimating the operating parameters of the energy life support system are outlined. Development and calculation of microclimate systems (heating, ventilation, air conditioning). Energy- saving measures in energy systems that provide comfortable living conditions. The issues of labor protection and safety are also considered.
Purpose of studying of the discipline
The purpose of the discipline is to study the structure, and technical foundations and principles of functioning of production systems, transport and consumption of technological energy carriers in accordance with the requirements of reliability, efficiency and safety.
Learning Outcomes
ON10 Calculate and regulate energy production and distribution systems.
Prerequisites
Bases of economics, law and ecological knowledge
Postrequisites
Final examination

Final examination

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

Diploma project

Credits count	8

Comprehensive exam

Credits count	8

4.Summary table on the scope of the educational program

«6B07103 - Power Engineering»

Name of discipline	Cycle/ Component	Term	Number of credits	Total hours	Lec	SPL	LC	IWST	IWS	Knowledge control form
Module 1. Fundamentals of social and humanitarian knowledge										
Foreign language	GER/CC	1	5	150		45		35	70	Examination
Kazakh language	GER/CC	1	5	150		45		35	70	Examination
Bases of economics, law and ecological knowledge	GER/US	1	5	150	15	30		35	70	Examination
Russian language	GER/CC	1	5	150		45		35	70	Examination
Physical Culture	GER/CC	1	2	60		60				Differentiated attestation
Kazakh language	GER/CC	2	5	150		45		35	70	Examination
Foreign language	GER/CC	2	5	150		45		35	70	Examination
History of Kazakhstan	GER/CC	2	5	150	30	15		35	70	Qualification examination
The module of socio-political knowledge (sociology, political science, cultural studies, psychology)	GER/CC	2	8	240	30	45		55	110	Examination
Russian language	GER/CC	2	5	150		45		35	70	Examination
Physical Culture	GER/CC	2	2	60		60				Differentiated attestation
Physical Culture	GER/CC	3	2	60		60				Differentiated attestation
World of Abai	BS/US	3	3	90	15	15		20	40	Examination
Information and communication technology	GER/CC	4	5	150	15	15	15	35	70	Examination
Physical Culture	GER/CC	4	2	60		60				Differentiated attestation
Philosophy	GER/CC	5	5	150	15	30		35	70	Examination
Module 10. Efficiency of energy systems and their feasibility study										
Economics of enterprise	BS/US	7	3	90	15	15		20	40	Examination
Undergraduate practice	AS/CCh	8	15	450						Total mark on practice
Manufacturing practice III	AS/CCh	8	15	450						Total mark on practice
Module 2. Natural sciences										
Mathematics	BS/US	1	5	150	15	30		35	70	Examination
Physics	BS/US	1	3	90	15	15	0	20	40	Examination
Chemistry	BS/US	3	5	150	15	15	15	35	70	Examination
Module 3. Requirements and norms for the design of engineering documentation in educational, scientific and professional activities										
Introduction to the specialty	BS/CCh	1	3	90	15	15		20	40	Examination

The history of the development of thermal power engineering	BS/CCh	1	3	90	15	15		20	40	Examination
Fundamentals of thermal power engineering	BS/CCh	1	3	90	15	15		20	40	Examination
Application of USDD standards in the design of engineering documentation.	BS/US	2	5	150	15	30		35	70	Examination
Educational practice	BS/US	2	2	60						Total mark on practice
Module 4. Fundamental laws of mechanics, thermodynamics and heat and mass transfer										
Theoretical and applied mechanics	BS/US	3	3	90	15	15		20	40	Examination
Theoretical basics of heat engineering	BS/CCh	3	5	150	15	30	0	35	70	Examination
Heat engineering	BS/CCh	3	5	150	15	30	0	35	70	Examination
Thermodynamics and heat transfer	BS/CCh	3	5	150	15	30	0	35	70	Examination
Heat and mass transfer	BS/CCh	4	5	150	15	30		35	70	Examination
Technical thermodynamics	BS/CCh	4	5	150	30	15		35	70	Examination
Fluid and gas mechanics	BS/US	4	5	150	15	30	0	35	70	Examination
Heat and mass transfer processes and apparatuses thermotehnologi	BS/CCh	4	5	150	15	30		35	70	Examination
Heat and mass transfer in power plants	BS/CCh	4	5	150	15	30		35	70	Examination
Thermal energy systems and energy use	BS/CCh	4	5	150	30	15		35	70	Examination
Thermodynamic fundamentals cycles of thermal power plants	BS/CCh	4	5	150	30	15		35	70	Examination
Theoretical foundations of refrigeration technology	BS/CCh	5	5	150	15	30	0	35	70	Examination
Refrigeration technology	BS/CCh	5	5	150	15	30	0	35	70	Examination
Refrigeration machines	BS/CCh	5	5	150	15	30	0	35	70	Examination
Module 5. Automation and Information technology										
Computer technologies in thermal power engineering	BS/CCh	3	5	150	15	15	15	35	70	Examination
Theoretical foundations of electrical engineering	BS/CCh	3	5	150	15	15	15	35	70	Examination
Electrical engineering and electronics	BS/CCh	3	5	150	15	15	15	35	70	Examination
Electrical engineering, electronics and electric drive	BS/CCh	3	5	150	15	15	15	35	70	Examination
Elements of machine graphics and CAD basics in thermal power engineering	BS/CCh	3	5	150	15	15	15	35	70	Examination
Automation of turbine plants	BS/CCh	6	5	150	15	30	0	35	70	Examination
Automation of the power equipment of thermal and nuclear power plants	BS/CCh	6	5	150	15	30	0	35	70	Examination
Dosimetric instruments	BS/CCh	6	5	150	15	15	15	35	70	Examination
Means of accounting and control in the thermal power industry	BS/CCh	6	5	150	15	15	15	35	70	Examination
Technical instruments and measurements in thermal power engineering	BS/CCh	6	5	150	15	15	15	35	70	Examination
Module 6. Innovative technologies of engineering and heat technologies										
High temperature materials and coverings	BS/CCh	5	5	150	30	15	0	35	70	Examination

Air conditioning and refrigeration	BS/CCh	5	5	150	30	15	0	35	70	Examination
Design of turbine plants	BS/CCh	6	5	150	15	15	15	35	70	Examination
Heat pumps	BS/CCh	6	5	150	15	15	15	35	70	Examination
Energy saving in industrial enterprises	BS/CCh	7	5	150	30	15		35	70	Examination
Basics of nature	BS/CCh	7	5	150	30	15		35	70	Examination
Modern methods of energy conversion (in english)	BS/CCh	7	5	150	15	30		35	70	Examination
Modern methods of energy conversion (in russian)	BS/CCh	7	5	150	15	30		35	70	Examination
Energy in Kazakhstan	BS/CCh	7	5	150	15	30		35	70	Examination
Energy saving in heat power engineering and heat technology	BS/CCh	7	5	150	30	15		35	70	Examination
Alternative and renewable energy sources	AS/CCh	7	5	150	15	30		35	70	Examination
Basics of alternative energy	AS/CCh	7	5	150	15	30		35	70	Examination
Theoretical Foundations of spectrometry	AS/CCh	7	5	150	15	30		35	70	Examination
Module 7. Fundamentals of calculations of heat power and heat technology installations and systems										
Manufacturing practice I	BS/US	4	5	150						Total mark on practice
Special questions fuel combustion	AS/CCh	4	5	150	15	30		35	70	Examination
Gas turbines and GTP	AS/CCh	4	5	150	15	30		35	70	Examination
Boiler installations and steam generators	AS/CCh	5	5	150	15	30	0	35	70	Examination and term work/Project
Installation and operation of heat and power equipment	AS/CCh	5	5	150	15	30	0	35	70	Examination and term work/Project
Power boilers and low-capacity boiler plants	AS/CCh	5	5	150	15	30	0	35	70	Examination and term work/Project
Physico-chemical methods of water preparation	AS/CCh	6	5	150	15	15	15	35	70	Examination
Water conditioning	AS/CCh	6	5	150	15	15	15	35	70	Examination
Waste water treatment technology	AS/CCh	6	5	150	15	15	15	35	70	Examination
Module 8. Typical calculation and design methods										
Steam turbines	AS/CCh	5	5	150	15	30		35	70	Examination and term work/Project
The turbines of thermal and nuclear power stations	AS/CCh	5	5	150	15	30		35	70	Examination and term work/Project
Manufacturing practice II	BS/US	6	5	150						Total mark on practice
Hydraulic machine	AS/CCh	6	5	150	30	15		35	70	Examination
Compressors, fans and pumps	AS/CCh	6	5	150	30	15		35	70	Examination
Superchargers and heat engines	AS/CCh	6	5	150	30	15		35	70	Examination
Thermal mechanical and auxiliary equipment of power plants	BS/CCh	7	5	150	30	15		35	70	Examination

Technological energy resources of enterprises	BS/CCh	7	5	150	30	15		35	70	Examination
Refrigeration units	BS/CCh	7	5	150	30	15		35	70	Examination
Design and research activity	AS/US	7	3	90	15	15		20	40	Examination
Module 9. Energy production and distribution systems										
Industrial heat and mass transfer processes and installation	AS/CCh	5	5	150	15	30		35	70	Examination and term work/Project
Thermal and nuclear power stations	AS/CCh	5	5	150	15	30		35	70	Examination and term work/Project
Energye equipment NPI	AS/CCh	5	5	150	15	30		35	70	Examination and term work/Project
Principles of NPP safety assurance	AS/CCh	7	6	180	30	30		40	80	Examination
The thermal network	AS/CCh	7	5	150	15	30		35	70	Examination and term work/Project
Operation and technical service of turbine equipment	AS/CCh	7	5	150	15	30		35	70	Examination and term work/Project
TPP operation and safety precautions	AS/CCh	7	6	180	30	30		40	80	Examination
Energy life support systems and safety	AS/CCh	7	6	180	30	30		40	80	Examination
Final examination										
Diploma project		8	8	240						
Comprehensive exam		8	8	240						