



EDUCATIONAL PROGRAM

6B05 - Natural Sciences, Mathematics and Statistics
(Code and classification of the field of education)

6B053 - Physical and chemical sciences
(Code and classification of the direction of training)

0530
(Code in the International Standard Classification of Education)

B054 - Physics
(Code and classification of the educational program group)

6B05303 - Technical physics
(Code and name of the educational program)

Bachelor
(Level of preparation)

Semey

Educational program

6B05 - Natural Sciences, Mathematics and Statistics

(Code and classification of the field of education)

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0530

(Code in the International Standard Classification of Education)

B054 - Physics

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6B05303 - Technical physics

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Bachelor

(Level of preparation)

PREFACE

Developed

The educational program 6B05303 - Technical physics in the direction of preparation 6B053 - Physical and chemical sciences 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).

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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.

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1.Introduction

1.1.General data

1.1. Department of "Technical Physics and Heat Power Engineering" of the Faculty of Engineering and Technology of the NJSC «University named after Shakarim of the city of Semey» , carries out training in the educational program "6B05303 Technical Physics", taking into account the needs of the regional labor market, the re-quirements of regulatory documents of the Ministry of Education and Science of the Republic of Kazakhstan. When implementing the educational program, training is carried out in the specialization of training - these are "Nuclear Reactors and Power Plants" and "Engineering and Physics of Low Temperatures". These areas of training of specialists in the field of nuclear energy and low-temperature tech-nology in the territory of the Republic of Kazakhstan within the framework of the educational program are not produced by anyone other than the Shakarim State University of Semey. The training of bachelors in this area is carried out in close cooperation with the National Nuclear Center of the Republic of Kazakhstan (Kur-chatov), on the basis of which a branch of the department has been opened. On the basis of the branch, all types of internships are carried out, as well as diploma de-sign. The leaders of the diploma projects are leading specialists from research la-boratories. The defense of diploma projects is carried out at the NNC RK with the involvement of leading scientists. This approach in the education process allows to prepare future specialists in the field of technical physics, 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 205 credits of theoretical training, as well as at least 27 credits of practical training, 8 credits of final certification.

A total of criterion for the completion of the educational process for the preparation of bachelors is the mastering by students of at least 240 credits

1.3.Typical study duration: 4 years.

2.PASSPORT OF THE EDUCATIONAL PROGRAM

2.1.EP purpose	Preparation of specialists with extensive knowledge for modern high-tech industries focused on design, technological and developmental activities in the field of technical physics related to the nuclear industry and low-grade technology.
2.2.Map of the training profile within the educational program	
Code and classification of the field of education	6B05 - Natural Sciences, Mathematics and Statistics
Code and classification of the direction of training	6B053 - Physical and chemical sciences
Code in the International Standard Classification of Education	0530
Code and classification of the educational program group	B054 - Physics
Code and name of the educational program	6B05303 - Technical physics
2.3.Qualification characteristics of the graduate	
Degree awarded / qualification	Bachelor of Science in Education Program
Name of the profession / list of positions of a specialist	They can hold primary positions: physicist, circuit engineer, electronic engineer, technologist, specialist of the highest, I and II categories, senior laboratory assistant, engineer.
QQF 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 nuclear energy and low-temperature technology. Scientific research institutions. Higher and secondary specialized educational institutions.
Types of professional activity	Experimental - research. Research. Production and technological. Installation and operational. Organizational and managerial.
Graduate Model	<p>Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.</p> <p>Apply laws and regulations in the field of economics and law, ecology and life safety, as well as the skills of entrepreneurship, leadership, and receptivity of innovations.</p> <p>To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.</p> <p>Apply in the educational, scientific and professional activities the requirements of the rules and standards of documentation.</p> <p>Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.</p> <p>Operate knowledge in the field of electrical engineering, measuring instruments, electronics and information technology in their subject area.</p> <p>Apply laws describing the flow of physical processes</p>

in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities. Use the rules of work organization with compliance with safety requirements on the basis of the relevant legislative and regulatory framework in the field of labor protection, radiation safety, fire safety in the energy sector.

To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology. Conduct feasibility studies of the efficiency of energy systems in the field of high and low temperatures, energy-saving equipment using the necessary materials of existing industries.

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	27038 (3012884)
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	27036 (3012880)
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
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Discipline component	University component
SubjectID	27039 (3012971)
Course	1
Term	1
Credits count	5
Lectons	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	27037 (3012883)
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	26674 (3012876)

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	27046 (3012881)
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

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

Prerequisites

Kazakh language

Postrequisites

Basic and profile disciplines of the EP

Foreign language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	27048 (3012885)
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	27721 (3012967)
Course	1
Term	2
Credits count	5
Lectons	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	27049 (3012969)
Course	1
Term	2
Credits count	8
Lectons	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	27047 (3012882)
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	27045 (3012877)
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	27730 (3012879)
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	27776 (3012964)
Course	2
Term	1
Credits count	3
Lectures	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	27779 (3012970)
Course	2
Term	2
Credits count	5

Lectons	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 significance 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 fields of professional activity, scientific 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

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

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

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	27777 (3012878)
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	27926 (3012893)
Course	3
Term	1
Credits count	5
Lectons	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 2. Application in cognitive and professional activities of basic knowledge in the field of mathematics and physics

Mathematics

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	27041 (3012895)
Course	1
Term	1
Credits count	5
Lectons	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 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Physics

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	27040 (3012894)
Course	1
Term	1
Credits count	3
Lectons	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 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Module 3. Application in educational, scientific and professional activities of the requirements to the graduate

Introduction to Specialty

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27044 (3012898)
Course	1
Term	1
Credits count	3
Lectures	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 "Introduction to specialty" introduces students to the basics of obtaining artificial cold, and its use in various industries, and with the development of refrigeration technology, as well as with the field of application of nuclear energy, the structure of the nuclear industry of the Republic of Kazakhstan. Physical methods of obtaining electrical and thermal energy. Nuclear fuel and coolants. The role of foreign and domestic scientists in the development of nuclear energy.

Purpose of studying of the discipline

Acquaintance of students with the physical foundations of obtaining artificial cold, its use in various industries, as well as with the use of nuclear energy.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON4 Apply in the educational, scientific and professional activities the requirements of the rules and standards of documentation.

Prerequisites

School course

Postrequisites

Nuclear research reactors Refrigerators

History of the development of energy

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27042 (3012896)
Course	1
Term	1
Credits count	3
Lectures	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 "History of the development of energy" forms knowledge on the history of the development of science and technology in the field of energy. Methodological foundations of the history of the development of science and technology. Creation of a steam turbine. The invention of the steam engine. Historical and technical prerequisites for the emergence of qualitatively new technical objects. Cycles

of steam power plants, internal combustion engines, gas turbine plants, jet and rocket engines, nuclear thermal power plants, refrigeration plants.

Purpose of studying of the discipline

The development of theoretical and practical knowledge by students and the acquisition of skills and abilities in the field of energy, as well as the formation of students' knowledge and skills as part of their professional training.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

School course

Postrequisites

Nuclear research reactors Refrigerators

Basics of Alternative Energy

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27043 (3012897)
Course	1
Term	1
Credits count	3
Lectons	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 "Basics of Alternative Energy " forms the general principles of the foundations of non-traditional energy in solving problems of energy use in heat engineering production. Within the framework of environmental problems of energy and the dynamics of consumption of energy resources, energy sources and the development of the energy sector. Place non-traditional energy needs of non-traditional energy sources. geothermal energy. Solar energy installations. Physical bases of processes of transformation of solar and wind energy.

Purpose of studying of the discipline

Familiarization of students with the technology of energy production based on non-traditional energy.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

School course

Postrequisites

Nuclear research reactors Refrigerators

Application of USDD standards in the design of engineering documentation.

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	27052 (3012951)
Course	1
Term	2
Credits count	5
Lectons	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 Apply in the educational, scientific and professional activities the requirements of the rules and standards of documentation.

Prerequisites

School course

Postrequisites

Elements of computer graphics and CAD bases in technical physics

Educational practice

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	27050 (3012889)
Course	1
Term	2
Credits count	2
Study practices	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 «Technical physics», 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

Mastering the necessary basic knowledge and skills in the chosen field of study.

Learning Outcomes

ON4 Apply in the educational, scientific and professional activities the requirements of the rules and standards of documentation.

Prerequisites

Introduction to Specialty

Postrequisites

Manufacturing practice I

Module 4. Application of fundamental laws of mechanics, thermodynamics and heat exchange

Theoretical basics of heat engineering

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27731 (3012901)
Course	2
Term	1
Credits count	5
Lectures	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 "Theoretical basics of heat engineering" studies: the most rational ways of using heat, analysis of the efficiency of the working processes of thermal installations, to create new most advanced types of thermal units with the skillful combination of these processes. Without this, it would be impossible to create powerful steam and gas turbine plants, jet engines and other types of complex thermal installations. There are two fundamentally different uses of heat: energy; technological.

Purpose of studying of the discipline

Theoretical and practical training of future specialists in the methods of obtaining, transforming, transferring and using heat to such an extent that they could select and, if necessary, exploit the necessary thermal engineering equipment of the national economy sectors in order to maximize the economy of fuel and energy resources and materials, intensify and optimize technological processes, and identify secondary energy.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

Prerequisites

Physics

Postrequisites

Heat and Mass Transfer Energyequipment NEI Air conditioning and ventilation

Heat engineering

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27736 (3012902)
Course	2
Term	1
Credits count	5
Lectures	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 " Heat engineering " studies the basic laws of heat and mass transfer of thermal and caloric properties of substances of the interconversion of energy, heat and work. A science that studies the cycles of heat engines, stationary and non-stationary heat conduction, methods of heat transfer, the differential equation of heat conduction, types and classification of fuel, methods of fuel combustion, as well as methods for obtaining, converting, transferring and using heat, and performing standard heat engineering calculations.

Purpose of studying of the discipline

Students acquire the skills to use the laws of thermodynamics and heat transfer in solving practical problems related to technological thermal processes and the principles of thermal devices.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

Prerequisites

Physics

Postrequisites

Heat and Mass Transfer Energyequipment NEI Air conditioning and ventilation

Thermodynamics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27739 (3012903)
Course	2
Term	1
Credits count	5
Lectures	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 "Thermodynamics" studies: Basic concepts and definitions. Ideal gas laws. gas mixtures. First and second law of thermodynamics. Phase transitions and equilibrium of thermodynamic systems. real gases. T-S and h-S diagrams and thermodynamic tables of the state of matter. Thermodynamic processes of water and steam. h-d diagram of moist air. Moist air drying processes. Throttling. Thermal power gas cycles. refrigeration cycles. Heat pump cycle.

Purpose of studying of the discipline

training and the application of methods of thermodynamics-ki for the analysis of physical-chemical phenomena of modern methods of analysis and calculation of the thermodynamic processes and cycles.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

Prerequisites

Physics

Postrequisites

Heat and Mass Transfer Energyequipment NEI Air conditioning and ventilation

Technical Mechanics

Discipline cycle	Basic disciplines
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Discipline component	University component
SubjectID	27051 (3012899)
Course	2
Term	1
Credits count	5
Lectons	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 "Technical Mechanics" studies the following theoretical sections: Technical Mechanics: Statics. Kinematics of a point and a rigid body. Dynamics of a material point and theorems. Resistance of materials: strength and deformation; bending and twisting; thin-walled shells; fatigue strength; endurance in bending and torsion; stability of compressed rods, pipes and shells. Machine parts: shafts and axles; bearings, couplings, drives; calculation and design.

Purpose of studying of the discipline

Study of mechanical phenomena, general principles of design and construction, building models and algorithms for calculating typical mechanical engineering products, taking into account their main performance criteria.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

Prerequisites

Mathematics

Postrequisites

Bases for design and construction of refrigerating machines with elements of CAD Controlled thermonuclear fusion

Fluid Dynamics

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	27833 (3012900)
Course	2
Term	2
Credits count	5
Lectons	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 "Fluid Dynamics" provides an in-depth study of hydraulic machines and other devices for processing and moving gaseous liquids, fluid and gas mechanics. And includes the following theoretical sections: Dynamics and statics of liquids and gases. Influence of traffic flow parameters. Elements of the theory of similarity and its application in the study of transfer processes. Calculations of the movement of liquids and gases in pipes, channels and boundary layers.

Purpose of studying of the discipline

Students gaining theoretical knowledge 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

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

Prerequisites

Physics

Postrequisites

Energyequipment NEI Air conditioning and ventilation

Heat and Mass Transfer

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27838 (3012905)
Course	2
Term	2

Credits count	5
Lectons	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 purpose of studying the discipline "Heat and Mass Transfer" is to provide students with extensive knowledge about the fundamental laws, regularities and methods of analysis and calculation of heat and mass transfer processes. In stationary heat conduction. Non-stationary thermal conductivity. Heat transfer by radiation. Convective heat transfer in a homogeneous medium. Forced and natural convection. Similarity of heat transfer phenomena. In heat transfer processes during phase transformations. In the processes of mass transfer and thermal calculation of heat transfer calculations.

Purpose of studying of the discipline

To give students extensive knowledge about the fundamental laws, regularities and methods of analysis and calculation of heat and mass transfer processes, to develop practical skills in determining the characteristics of heat and mass transfer processes of heat power devices and apparatuses.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

Prerequisites

Thermodynamics

Postrequisites

Fundamentals of reactor physics Air conditioning and ventilation

Heat and mass transfer processes and apparatuses thermotechnology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27840 (3012906)
Course	2
Term	2
Credits count	5
Lectons	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 purpose of studying the discipline "Heat and mass transfer processes and apparatuses thermotechnology" students gain knowledge in the field of the basics of calculating heat exchangers, heat and mass transfer, and the theory of heat transfer. Methods of similarity and dimensions. Heat and mass transfer in furnaces. Qualitative theory for estimating the heat transfer coefficient for forced and free convection. Heat transfer in drying installations. Heat transfer enhancement methods. Types. Heat exchanger efficiency. Thermal and hydraulic calculation of heat exchangers.

Purpose of studying of the discipline

The acquisition of knowledge by students in the theory of heat transfer, heat and mass transfer, and the basis of calculation of heat exchangers.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

Prerequisites

Thermodynamics

Postrequisites

Fundamentals of reactor physics Air conditioning and ventilation

Chemical thermodynamics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27837 (3012904)
Course	2
Term	2
Credits count	5
Lectons	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 "Chemical thermodynamics" studies the scope of modern methods of analysis and calculation of thermodynamic processes, and cycles of thermodynamic methods and for the analysis of physical and chemical phenomena. as well as chemical balance. chemical potential. Application of the first law of thermodynamics to chemical processes. Phase equilibria. Characteristic functions and thermodynamic potentials. Thermal effects of chemical reactions at $V = \text{const}$ and $p = \text{const}$.

Purpose of studying of the discipline

Formation of students` knowledge of the basic laws of chemical thermodynamics and methods for calculating the thermodynamic parameters of chemical-technological processes.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

Prerequisites

Thermodynamics

Postrequisites

Fundamentals of reactor physics Air conditioning and ventilation

Module 5. Operation of knowledge in the field of electrical engineering, electronics and information technology

Computer technologies in the energy sector

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27770 (3012911)
Course	2
Term	1
Credits count	5
Lectons	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 "Computer technologies in the energy sector" forms students` knowledge in the field of using computer technology in the calculations of heat and power processes.

Excel spreadsheet processors, mathematical packages MathCAD, DBMS, information systems. Application of methods for solving linear systems in thermal engineering calculations, transcendental, nonlinear, stationary and non-stationary equations of heat conduction. Construction of models of thermal power facilities. Application of finite difference methods to the equations of convective heat transfer.

Purpose of studying of the discipline

The main goal of this course is the formation of students` knowledge, skills and abilities to use modern automated projects in energy processes.

Learning Outcomes

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

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Application of USDD standards in the design of engineering documentation.

Postrequisites

Final examination Bases for design and construction of refrigerating machines with elements of CAD Controlled thermonuclear fusion

Simulation of the electric

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27743 (3012908)
Course	2
Term	1
Credits count	5
Lectons	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 discipline, the device and principle of operation of electrical machines of direct and alternating current, as well as methods for their calculation are considered. The basic principles and methods of modeling, development and analysis of mathematical models that reflect the static and dynamic properties of electric drives, methods for calculating various DC magnetic circuits are considered. Students learn to develop a functional, logical and technical model of electric drives.

Purpose of studying of the discipline

the study of methods for modeling, design and analysis of mathematical models that reflect the static and dynamic properties of the electrical drives.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

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

Prerequisites

Physics

Postrequisites

Automation of refrigeration ACS processes NPI

Applied Electronics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27740 (3012907)
Course	2
Term	1
Credits count	5
Lectons	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 main properties of semiconductor materials and the processes occurring in the p-n-junction are considered. The device and principle of operation of electronic elements based on the use of a p-n junction, as well as methods for calculating electronic circuits based on these devices, are being studied. The second part of the discipline considers digital elements and devices, ways to minimize logic functions, methods of synthesis and analysis of electronic circuits using digital devices.

Purpose of studying of the discipline

Getting the students Knowing of the physical processes that determine the operating principle, the properties, characteristics and parameters of the various semi-conductor devices, discrete and integrated performance.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

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

Prerequisites

Physics

Postrequisites

Automation of refrigeration ACS processes NPI

Electrical engineering and electronics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27748 (3012966)
Course	2
Term	1
Credits count	5
Lectons	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

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

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

Prerequisites

Physics

Postrequisites

Automation of refrigeration ACS processes NPI

Elements of computer graphics in technical physics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27764 (3012909)
Course	2
Term	1
Credits count	5
Lectons	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 "Elements of computer graphics in technical physics" studies the use of modern computer-aided design systems. Effective use of graphic editors. Color palette. Features and settings for CorelDraw, AutoCAD and Visio. Work with graphics and text. Basic concepts of three-dimensional graphics. Graphic data formats. Features of setting parameters and studying the interface and setting parameters of vector graphics editors.

Purpose of studying of the discipline

Formation of students` knowledge, skills and abilities to use elements of computer graphics.

Learning Outcomes

ON4 Apply in the educational, scientific and professional activities the requirements of the rules and standards of documentation.

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

Prerequisites

Application of USDD standards in the design of engineering documentation.

Postrequisites

Final examination Bases for design and construction of refrigerating machines with elements of CAD Controlled thermonuclear fusion

Elements of computer graphics and CAD bases in technical physics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27769 (3012910)
Course	2
Term	1
Credits count	5
Lectons	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 "Elements of computer graphics and CAD bases in technical physics" forms the student's use of computer technology in heat technology. General information about application software, mathematical packages, MathCAD system. Computer graphics, basic representations of graphic data and their formats. Features of AutoCAD, setting parameters, working with graphics, text, studying the interface and setting parameters of the vector graphics editor AutoCAD.

Purpose of studying of the discipline

Formation of the student's knowledge, skills and abilities in the field of using modern computer-aided design systems in technical physics.

Learning Outcomes

ON4 Apply in the educational, scientific and professional activities the requirements of the rules and standards of documentation.

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

Prerequisites

Application of USDD standards in the design of engineering documentation.

Postrequisites

Final examination Bases for design and construction of refrigerating machines with elements of CAD Controlled thermonuclear fusion

Module 6. Application of physical laws in educational, research and practical activities

Applied Optics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27760 (3012963)
Course	2
Term	1
Credits count	3
Lectons	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

The purpose of studying the discipline is to familiarize students with the scale of physical quantities of subatomic physics, methods of their theoretical understanding and experimental observation, and the main physical phenomena occurring in the subatomic microcosm. Optics of the eye, optical systems of a microscope, optics of photographic and opto-electronic and television systems, reproduction and projection optical systems, analysis of computer simulation of optical systems, image quality assessment.

Purpose of studying of the discipline

To familiarize students with the basic physical phenomena in the governing proish-subatomic microcosm, methods of their theoretical understanding and experimental observation, the scale of the physical quantities of subatomic physics.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

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

Prerequisites

Physics

Postrequisites

Final examination Nuclear fuel cycle

Elementaric particle Physics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27752 (3012961)
Course	2
Term	1
Credits count	3
Lectons	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

The discipline "Elementary particle Physics" studies the basic concepts and concepts of quantum field theory. The concept of elementary particles. Quantization of the electromagnetic field. Lagrangian approach in field theory. Real scalar field. Complex scalar field. Amplitudes and transition probabilities. Interaction representation. Mass and spin-helicity. Erlangen program. Broadcast generators. Rotation generators. The first Casimir operator and the rest mass of elementary particles.

Purpose of studying of the discipline

To introduce students SOS mainly notions and concepts quantum-field theory.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics

Postrequisites

Final examination Nuclear fuel cycle

Nuclear physics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27757 (3012962)
Course	2
Term	1
Credits count	3
Lectures	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

The purpose of studying the discipline: is the acquisition by students of knowledge, skills and abilities in the field of nuclear physics, and necessary for research, design, technological and production activities. Subject, goals and objectives; their place and significance in modern natural science; conditions and stages of nuclear fission, types of radioactivity and radioactive families, static properties of nuclei, nuclear reactions, interaction of radiation with matter.

Purpose of studying of the discipline

Mastering students with fundamental concepts, laws and theories of nuclear physics.

Learning Outcomes

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics

Postrequisites

Final examination Nuclear fuel cycle

Introduction to Medical Physics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27846 (3012914)
Course	2
Term	2
Credits count	5
Lectures	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 "Introduction to Medical Physics" studies and assimilates the devices and operation of medical equipment, understanding of physical laws in biological systems, biomechanics, acoustics, lasers and their application in medicine, the basics of medical electronics, the physical foundations of the use of sound and ultrasound in medicine, the transfer process in biological systems, bioelectrogenesis, electrical and magnetic properties of tissues and the environment, ionizing radiation.

Purpose of studying of the discipline

the assimilation of features of the manifestation of physical laws in biological systems, an understanding of the structure and operation of medical equipment.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

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

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

Prerequisites

Physics

Postrequisites

Applied physics and radiation safety

Molecular Physics and Thermodynamics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27849 (3012916)
Course	2
Term	2
Credits count	5
Lectures	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 "Molecular physics and thermodynamics" contains: Three principles of thermodynamics. The basic equation of state for an ideal gas. Thermal engines and their efficiency. Transfer phenomena (diffusion, thermal conductivity, internal friction). Isoprocesses. Gases, liquids and solids, their changes as a result of external influences (pressure, temperature, electric and magnetic fields). Phase equilibrium and transient processes (crystallization and melting, evaporation and condensation).

Purpose of studying of the discipline

Formation of students' professional competencies related to the use of fundamental concepts, as well as modern concepts in the field of thermodynamics and molecular physics.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

Prerequisites

Thermodynamics

Postrequisites

Final examination

Applied Thermal Physics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27850 (3012917)
Course	2
Term	2
Credits count	5
Lectures	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

Discipline "Applied Thermal Physics" studies: Quantum statistics and their application in the foundations of molecular kinetic theory.

Thermal processes in gases. Thermodynamic reversible and irreversible processes. In the study of physical phenomena, the development of techniques and skills for conducting experimental and scientific experiments. When solving specific technological and practical applications that set as their goal physical problems, a complex of scientific disciplines and sections of physics directions are studied.

Purpose of studying of the discipline

Formation of students' skills and abilities to use fundamental laws, theories of classical and modern physics, as well as methods of physical research to solve theoretical and experimental-practical learning tasks from various fields of physics, the formation of students' skills in independent cognitive activity, the development of techniques and skills experimental scientific studies of physical phenomena that help to further solve specific problems in professional activity.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Thermodynamics

Postrequisites

Final examination

Manufacturing practice I

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	27780 (3012887)
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 Use the rules of work organization with compliance with safety requirements on the basis of the relevant legislative and regulatory framework in the field of labor protection, radiation safety, fire safety in the energy sector.

Prerequisites

Educational practice

Postrequisites

Manufacturing practice II

Statistical physics and thermodynamics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27848 (3012915)
Course	2
Term	2
Credits count	5
Lectures	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

Discipline "Statistical physics and thermodynamics" contains: All principles of thermodynamics; Temperature and entropy when micro-canonical, canonical, or greater canonical distributions can be applied; Quantum distributions of Fermi-Dirac, Bose-Einstein and Planck as well as classical distributions of Maxwell and Boltzmann; The probabilistic approach lies not in the nature of things, as in quantum theory, but is associated with the impossibility of a detailed description of systems.

Purpose of studying of the discipline

The purpose of this course is to familiarize students with the basic concepts and principles of statistical physics and thermodynamics.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

Prerequisites

Thermodynamics

Postrequisites

Final examination

Neutron transport theory

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27845 (3012913)
Course	2
Term	2
Credits count	5
Lectons	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 " Neutron transport theory " forms the student's ideas about the methods of their theoretical understanding and experimental observation and the theoretical foundations of neutron transport. Concepts about neutron gas temperature; scattering law; scattering of neutrons on an immobile nucleus; diffusion of neutrons; neutron slowdown in infinite media; thermalization of neutrons; spatial distribution of moderating neutrons; continuous deceleration model; effective resonance integral.

Purpose of studying of the discipline

To form students` systematic knowledge in the field of neutron transport theory.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

Prerequisites

Physics

Postrequisites

Applied physics and radiation safety

The nuclear and neutron physics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27842 (3012912)
Course	2
Term	2
Credits count	5
Lectons	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 studying the discipline acquiring skills in processes in nuclear and thermonuclear reactors and solving problems for various processes and studying the elements of quantum mechanics, the proton-neutron model of the nucleus, neutron binding energies, nuclear forces, radioactive nuclei, energy schemes of a nuclear reaction, neutron physics, neutron source reactor, basic patterns of interaction of neutrons with nuclei in various energy regions, the spectrum of thermal neutrons.

Purpose of studying of the discipline

Mastering by students of fundamental knowledge in the field of neutron and nuclear physics, as well as areas of their practical application.

Learning Outcomes

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational,

research and practical activities.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics

Postrequisites

Applied physics and radiation safety

Atomic physics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28063 (3012953)
Course	3
Term	1
Credits count	5
Lectons	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 studies intra-atomic and atomic processes and phenomena. The concepts, questions and provisions related to atomic physics are outlined. Leading to the formation of modern physics decisive experiments and hypotheses. Spectrum of atoms energy discreteness; nuclear model of the atom; quantum properties of radiation; Bohr's theory; basic provisions of the quantum theory of atoms and atomic particles; quantum physics of many-electron and one-electron atoms, wave properties of particles.

Purpose of studying of the discipline

The study of the physical meaning and content of the basic laws and concepts of nuclear physics, establish the boundaries of applicability of these laws.

Learning Outcomes

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics The nuclear and neutron physics Neutron transport theory Elementaric particle Physics Nuclear physics

Postrequisites

Basic and profile disciplines of the EP Final examination Energyequipment NEI Fundamentals of reactor physics Nuclear research reactors Controlled thermonuclear fusion Nuclear fuel cycle Quantum mechanics Computational methods in quantum physics Quantum mechanics of molecules

Theoretical Foundations of spectrometry

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27946 (3012952)
Course	3
Term	1
Credits count	5
Lectons	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 introduces the basic concepts of spectroscopy. Registration methods and measurement methods classification of spectral methods according to the type of transitions under study. Technique and instruments of spectroscopy characteristics of spectral lines. Features of the molecular and atomic spectra of the spectral device. Photoelectric methods, photo registration, visual registration of spectra. Methods experimental stationary spectroscopy. Luminescent, absorption, emission, laser spectroscopy and thermally stimulated luminescence.

Purpose of studying of the discipline

To familiarize students with the theoretical basics of spectroscopy and formation of common principles and concepts of development directions and co-temporal methods spectrometry.

Learning Outcomes

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Elementaric particle Physics

Postrequisites

Basic and profile disciplines of the EP Final examination Quantum mechanics Radiometry Spectrometry radiation and methods of recording radiation

The physics of the atom and atomic phenomena

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28064 (3012954)
Course	3
Term	1
Credits count	5
Lectons	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 the structure and states of atoms. Methods for solving problems related to finding the properties of atomic phenomena are given. Atomic models, discreteness of atomic states. Magnetic and mechanical moments of the atom. The interaction is superfine. Interaction of a quantum system with radiation. X-ray spectra. Atoms are multielectron. Orbital interaction - Spin. The simplest motions of microparticles. An atom in the field of external forces. Corpuscular-wave dualism.

Purpose of studying of the discipline

Mastering the basic theory of the atom as a generalization of the results of physical experiments and theoretical ideas about the motion of a microscopic object.

Learning Outcomes

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics The nuclear and neutron physics Neutron transport theory Elementaric particle Physics Nuclear physics

Postrequisites

Basic and profile disciplines of the EP Final examination Controlled thermonuclear fusion Nuclear fuel cycle Quantum mechanics Computational methods in quantum physics Quantum mechanics of molecules

Physics of the condensed state

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27931 (3012918)
Course	3
Term	1
Credits count	5
Lectons	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 subject " Physics of the condensed state " contains:

Polaron Fröhlich. Acoustic and optical phonons, plasmons, Frenkel and Wannier excitons. Interaction of light with a crystal lattice, polaritons. Boson condensation. Kinetic properties of dielectrics, metals and semiconductors. Brillouon zone, energy zones. Adiabatic Born-Ehrenfest principle. Nonequilibrium electrons and holes. The state of electrons in a crystal lattice. Impurities and impurity levels. Scattering of charge carriers, conductivity. Superfluidity. Electron-phonon interactions.

Purpose of studying of the discipline

Getting students ideas about the current state of science in the field of condensed matter physics.

Learning Outcomes

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics

Postrequisites

Final examination

Physics of semiconductors and dielectrics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27934 (3012920)
Course	3
Term	1
Credits count	5
Lectons	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 subject "Physics of semiconductors and dielectrics" contains: Physical theories of semiconductors and dielectrics. Contact phenomena in semiconductors. Polarization of dielectrics. dielectric losses. Electrical conductivity, thermal conductivity and heat capacity. Scattering of electrons and holes in semiconductors. Statistics of electrons and holes in semiconductors. Generation and recombination of electrons and holes. Optical and photoelectric phenomena in semiconductors. Luminescence of semiconductors and dielectrics.

Purpose of studying of the discipline

Obtaining fundamental knowledge in the field of physics of semiconductors and dielectrics, as well as acquiring the skills necessary for their use in research activities.

Learning Outcomes

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

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

Prerequisites

Physics

Postrequisites

Final examination

Solid state physics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27933 (3012919)
Course	3
Term	1
Credits count	5
Lectons	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 subject " Solid state physics " contains: The structure of crystalline solids. Structure and symmetry of solids. Reverse lattice. Simple and complex lattices. Imperfections in crystals. Anisotropy and symmetry of physical properties, tensor description. Kinetic phenomena in metals and semiconductors. Quantum mechanics of electrons in solids. Optical properties of crystals. Dielectric and magnetic properties of substances.

Purpose of studying of the discipline

Formation of indepth ideas about the basic physical processes, phenomena and regularities of solid state physics.

Learning Outcomes

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics

Postrequisites

Final examination

Computational methods in quantum physics

Discipline cycle	Basic disciplines
Discipline component	Electives

SubjectID	28082 (3012956)
Course	3
Term	2
Credits count	5
Lectons	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 covers the main numerical methods of quantum simulation: the Monte Carlo method and the exact diagonalization method. Wave functions of an adequate discrete basis - the choice of a method, finding the correlation functions and the spectrum of systems described by the main types of quantum statistics - Fermi, Bose and spin. Problems of thermodynamic temperature characteristics and numerical analysis of various systems have been studied; the acquaintance of correlated states in modern models of physics was carried out: spin Bose-Hubbard, Hubbard models.

Purpose of studying of the discipline

Mastering the basic principles of computational experiment and familiarity with basic computational methods for solving problems in atomic physics, quantum theory of collisions and the physics of molecular clusters.

Learning Outcomes

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics The nuclear and neutron physics Neutron transport theory Theoretical Foundations of spectrometry Atomic physics The physics of the atom and atomic phenomena Nuclear physics

Postrequisites

Basic and profile disciplines of the EP Final examination

Quantum mechanics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28080 (3012955)
Course	3
Term	2
Credits count	5
Lectons	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 studies: fundamental principles of quantum mechanics, fundamentals of quantum mechanics in experiments, the simplest application of the Schrödinger equation, the mathematical apparatus of quantum mechanics, representation theory, the formulation of the matrix of quantum mechanics, the theory of angular momentum of quantum mechanics, the movement of bodies in a centrally symmetric field, approximate methods of quantum mechanics, from identical particles the foundations of systems theory, the methods of Thomas-Fermi and Hartree-Fock, relativistic elements of quantum mechanics.

Purpose of studying of the discipline

To give students representation, the physical content of quantum mechanics, and in-depth understanding of natural-step microcosm.

Learning Outcomes

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics The nuclear and neutron physics Neutron transport theory Theoretical Foundations of spectrometry Atomic physics The physics of the atom and atomic phenomena

Postrequisites

Basic and profile disciplines of the EP Final examination

Quantum mechanics of molecules

Discipline cycle	Basic disciplines
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Discipline component	Electives
SubjectID	28083 (3012957)
Course	3
Term	2
Credits count	5
Lectons	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 contains a presentation of the basic principles that underlie modern quantum chemistry. The main provisions and approximations used to study the electronic and spatial structure of molecules are formulated. An idea is given about point symmetry groups and methods for solving applied problems of quantum chemistry using group theory methods. Modern methods used to calculate various physicochemical properties of molecules are outlined.

Purpose of studying of the discipline

Getting practical skills describe the structure of molecular systems in the language of quantum mechanics using the symmetry of the problem.

Learning Outcomes

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics The nuclear and neutron physics Neutron transport theory Theoretical Foundations of spectrometry Atomic physics The physics of the atom and atomic phenomena Nuclear physics

Postrequisites

Basic and profile disciplines of the EP Final examination

Introduction to scientific activity

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	28097 (3013532)
Course	4
Term	1
Credits count	3
Lectons	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

In modern conditions, the training of competitive and highly professional specialists in the market of intellectual labor in the scientific field is of particular relevance. Further activities will be determined by how much he will be able to realize his potential in practice, systematically develop his scientific abilities. The student must be able to master the skills of working with various sources of information, offer the most effective solutions to emerging problems, analyze the real situation, and find the best ways to improve it.

Purpose of studying of the discipline

To prepare students for research work in the process of studying at the university and future professional activities.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON4 Apply in the educational, scientific and professional activities the requirements of the rules and standards of documentation.

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

ON10 Проводить технико-экономические обоснования эффективности работы энергетических систем в области высоких и низких температур, энергосберегающего оборудования с использованием необходимых материалов действующих производств.

Prerequisites

Basic and profile disciplines of the EP

Postrequisites

Final examination

Module 7. Using the legislative and regulatory framework to organize work in compliance with safety requirements

Applied physics and radiation safety

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27935 (3012921)
Course	3
Term	1
Credits count	5
Lectures	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 "Applied physics and radiation safety" studies: radioactivity, interactions of radiation with matter, the biological effect of radiation, dosimetry. The theoretical basis of the existing methods for measuring the dose of radiation and activity is based on the study of the mechanism of interaction of various types of ionizing radiation with matter. Methods of dosimetry and protection, where radioactive substances are used, in particular in nuclear power engineering in the design and operation of nuclear reactors.

Purpose of studying of the discipline

Formation at students in students the Knowing and skills of using the foundations of radiation safety for life safety.

Learning Outcomes

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Elementaric particle Physics

Postrequisites

Occupational health and safety in the Technical Physics

Principles of nuclear safety

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27941 (3012923)
Course	3
Term	1
Credits count	5
Lectures	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 " Principles of nuclear safety " studies: Analysis of the largest accidents at nuclear power plants. Norms and rules of radiation safety. Storage and handling of radioactive waste and spent fuel. Probabilistic safety analysis. Regulatory documents of the Republic of Kazakhstan in the field of the use of atomic energy to ensure quality and safety culture. The principle of defense in depth. Deterministic approach to security. Accident management.

Purpose of studying of the discipline

Obtaining knowledge by students on the basic principles of ensuring the safety of nuclear power plants, as well as the formation of skills in assessing the quantitative indicators of reliability and safety.

Learning Outcomes

ON2 Apply laws and regulations in the field of economics and law, ecology and life safety, as well as the skills of entrepreneurship, leadership, and receptivity of innovations.

ON4 Apply in the educational, scientific and professional activities the requirements of the rules and standards of documentation.

ON8 Use the rules of work organization with compliance with safety requirements on the basis of the relevant legislative and regulatory framework in the field of labor protection, radiation safety, fire safety in the energy sector.

Prerequisites

Elementaric particle Physics

Postrequisites

Occupational health and safety in the Technical Physics

Radioecology and radiation safety

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27937 (3012922)
Course	3
Term	1
Credits count	5
Lectures	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 "Radioecology and radiation safety" studies: the processes of dosimetry of ionizing radiation, radiation transformation of nuclei and issues related to the formation of natural and man-made radiation background. The main factors that give the problems of radiation safety the character of a global problem. Formation of the radiation background. Dosimetry of ionizing radiation. The main significant for radioecology natural and artificial radionuclides. When calculating the equivalent dose, weighting factors for individual types of radiation.

Purpose of studying of the discipline

Theoretical and practical training of students on issues of radiation safety, ensuring safe work with sources of ionizing radiation, their dosimetry and control.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON8 Use the rules of work organization with compliance with safety requirements on the basis of the relevant legislative and regulatory framework in the field of labor protection, radiation safety, fire safety in the energy sector.

Prerequisites

Elementaric particle Physics

Postrequisites

Occupational health and safety in the Technical Physics

Information technology and tech-niques in engineering education

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28073 (3012926)
Course	3
Term	2
Credits count	5
Lectures	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

Discipline " Information technology and tech-niques in engineering education " students must master the use of modern technology and technology in engineering education. Modern information technologies in engineering education based on the development of computer facilities.

The use of modern multimedia teaching aids and methods of their development.

Distance systems in education. Innovative technologies in the implementation of the system of control, evaluation and monitoring of educational achievements.

Purpose of studying of the discipline

Formation of readiness for the use of inno-vative technologies and techniques in the educational environment.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

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

Prerequisites

Introduction to Specialty Computer technologies in the energy sector Information and communication technology

Postrequisites

Basics of modern energy in English

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28072 (3012925)
Course	3
Term	2
Credits count	5
Lectures	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

Discipline " Basics of modern energy in English " students must master the basics of production and transportation of energy in English. And also have a general idea about energy. Features of devices and operation of power plants. Theoretical foundations of the processes accompanying the production of electricity. Interaction of energy objects with the environment. Indicators of thermal and general efficiency of power plants. Alternative energy sources.

Purpose of studying of the discipline

mastering the basics of energy production and transportation in English

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Foreign language

Postrequisites

Basic and profile disciplines of the EP Final examination

Basics of Heat Transformation

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28074 (3012933)
Course	3
Term	2
Credits count	5
Lectures	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 " Basics of Heat Transformation " studies vapor-liquid compression heat transformers (refrigeration and heat pump units). Thermodynamic bases of heat transformation processes. In off- design conditions operation of vapor- liquid compression heat transformers. Pressure and expansion machines of heat transformers and their energy characteristics. Jet heat transformers. Absorption heat transformers. Liquefaction and freezing of gases, low- temperature separation of gas mixtures. Gas- liquid compression heat transformers.

Purpose of studying of the discipline

The generation of knowledge about the principles of the most effective or optimal conversion of different types of energy.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

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

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics History of the development of energy Basics of Alternative Energy Introduction to Specialty Thermodynamics Heat and Mass Transfer Alternative and renewable energy sources

Postrequisites

Basic and profile disciplines of the EP Final examination

Manufacturing practice II

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	28069 (3012888)
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 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Manufacturing practice I

Postrequisites

Manufacturing practice III

Heat pumps

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28077 (3012949)
Course	3
Term	2
Credits count	5
Lectures	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 "Heat pumps" studies the prospects for the use of heat pump installations. Sources of low-potential heat. Indicators and analysis of energy efficiency of various types of heat pumps. Classification of heat pump installations. Schemes and principles of operation of heat pump installations. Heat supply systems with heat pumps. For individual heat supply, in district heating systems and industry, the use of heat pumps. Industrially produced heat pump installations.

Purpose of studying of the discipline

Formation of knowledge and skills needed in professional activities in the field of energy saving in the production process, carried out with the use of IP-heat pump installations.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics Basics of Alternative Energy Introduction to Specialty Fluid Dynamics Thermodynamics Heat and Mass Transfer Alternative and renewable energy sources Air conditioning and ventilation

Postrequisites

Basic and profile disciplines of the EP Final examination Bases for design and construction of refrigerating machines with elements of CAD Automation of refrigeration Installation, diagnostics and repair of refrigeration equipment

Heat and mass transfer in power plants

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28076 (3012934)
Course	3
Term	2
Credits count	5

Lectures	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 "Heat and mass transfer in power plants" prepares bachelors in the field of heat and mass transfer phenomena and technical systems and processes based on them. Processes of heat transfer on physical bases. Thermal conductivity in stationary processes. Heat conduction processes are non-stationary. Heat transfer is convective. Diffusion processes. Heat exchange during condensation and boiling. Heat transfer by radiation. Complex heat transfer. Heat exchangers in power plants. Heat carriers. Heat exchangers and their calculation.

Purpose of studying of the discipline

Bachelor in the field of transport phenomena of heat and mass, and technical systems and processes based on them.

Learning Outcomes

ON3 To apply in cognitive and professional activities basic knowledge in the field of mathematics and physics, methods of mathematical analysis and modeling, theoretical and experimental research.

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics History of the development of energy Basics of Alternative Energy Introduction to Specialty Fluid Dynamics Thermodynamics Heat and Mass Transfer Alternative and renewable energy sources

Postrequisites

Basic and profile disciplines of the EP Final examination

Formation of the technical thesaurus

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28071 (3012924)
Course	3
Term	2
Credits count	5
Lectures	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

Discipline "Formation of the technical thesaurus" students must form professionally significant skills and qualities necessary for the effective development and creation of a thesaurus-type terminological lexicon on a specific topic, problem, field of knowledge as an information basis and means of high-quality oral and written translation of scientifically-technical texts when exchanging between native speakers of different languages in a particular field of science through lexical means.

Purpose of studying of the discipline

Formation of professionally significant skills and qualities necessary for the effective design and creation of terminological vocabulary thesaurus type on a particular topic, domain of knowledge as an information basis and means for quality of interpretation and translation of scientific and technical texts in the implementation of exchanges between speakers of different languages.

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.

ON4 Apply in the educational, scientific and professional activities the requirements of the rules and standards of documentation.

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

Prerequisites

Introduction to Specialty

Postrequisites

Basic and profile disciplines of the EP Final examination

Basics cryosystems

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28084 (3012930)
Course	3
Term	2

Credits count	5
Lectures	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 "Basics cryosystems " studies: ideas about the areas of implementation of low-temperature processes and the behavior of substances at low temperatures. Gas and steam- compression refrigeration machines. Reverse thermodynamic cycles. Thermomechanical effects. Throttling compressed gas. Joule-Thompson effect. Isoentropic expansion of a gas. Differential and integral choke effects. desorption cooling. Cooling with vapor recovery. Refrigerators for He3-He4.dissolution.

Purpose of studying of the discipline

To study in conducting materials at low temperatures, to form ideas about the implementation of low-temperature processes.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics Thermodynamics Heat and Mass Transfer Chillers

Postrequisites

Basic and profile disciplines of the EP Final examination

Processes and equipment of cooling gas

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28086 (3012931)
Course	3
Term	2
Credits count	5
Lectures	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

Discipline "Processes and equipment of cooling gas " studies: Liquefaction of gases. Characteristics of air coolers (AVO). Transportation and storage of refrigerated and liquefied gases. Theoretical foundations for calculating heat exchangers. Joint work of AVO and gas pipeline. Regasification of liquefied gases, their use in technological installations. Devices and technologies. Fields of application of gas cooling apparatuses, physical principles underlying the designs.

Purpose of studying of the discipline

To give students needed-mye Knowing and skills on the use of devices and technologies used for cooling gases.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics Thermodynamics Heat and Mass Transfer Chillers

Postrequisites

Basic and profile disciplines of the EP Final examination

Thermophysical processes in cryogenic systems

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28088 (3012932)
Course	3
Term	2
Credits count	5
Lectures	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

Discipline "Thermophysical processes in cryogenic systems" studies: Transient processes in a heated channel; Cooled rod axial thermal conductivity; In cryogenic pipelines, thermal-hydraulic processes; Transient processes in pipelines; Non-stationary processes in isolation; In cryo-reservoirs, thermophysical processes; Cooling of cryofluids; Gasification of cryo-liquids; In low temperature insulation heat transfer; isolation technology; In non-stationary thermal-hydraulic processes, physical and mathematical models; Basic equations of flow motion.

Purpose of studying of the discipline

To study the behavior of materials at low temperatures.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics Thermodynamics Heat and Mass Transfer Chillers

Postrequisites

Basic and profile disciplines of the EP Final examination

Specifications and technical documentation on labor protection

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28106 (3012927)
Course	4
Term	1
Credits count	5
Lectures	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

In this discipline " Specifications and technical documentation on labor protection " documentation is considered in the preparation of action plans for labor protection. Legal basis for regulating relations in the field of labor protection between employers and workers. State regulatory requirements for labor protection. Normative documentation of the labor protection service. Accounting and reporting documents for accident insurance. Labor protection training.

Purpose of studying of the discipline

Formation of Knowing in the field of technology, safety and health.

Learning Outcomes

ON4 Apply in the educational, scientific and professional activities the requirements of the rules and standards of documentation.

ON8 Use the rules of work organization with compliance with safety requirements on the basis of the relevant legislative and regulatory framework in the field of labor protection, radiation safety, fire safety in the energy sector.

Prerequisites

Bases of economics, law and ecological knowledge

Postrequisites

Final examination

Occupational Safety and Health

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28108 (3012928)
Course	4
Term	1
Credits count	5
Lectures	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 subject of study of the discipline " Occupational Safety and Health " is the legal and organizational issues of labor protection. And also the legal and organizational foundations of labor protection are considered; basic concept and subject of labor protection; occupational health and industrial sanitation, fundamentals of physiology, fire safety, legal, socio-economic, medical and preventive, sanitary and hygienic, protective equipment and safety devices, organizational, technical, rehabilitation and other measures.

Purpose of studying of the discipline

Formation of the required level of Knowing and skills in legal and organizational matters of occupational safety.

Learning Outcomes

ON2 Apply laws and regulations in the field of economics and law, ecology and life safety, as well as the skills of entrepreneurship, leadership, and receptivity of innovations.

ON4 Apply in the educational, scientific and professional activities the requirements of the rules and standards of documentation.

ON8 Use the rules of work organization with compliance with safety requirements on the basis of the relevant legislative and regulatory framework in the field of labor protection, radiation safety, fire safety in the energy sector.

Prerequisites

Bases of economics, law and ecological knowledge

Postrequisites

Final examination

Occupational health and safety in the Technical Physics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28109 (3012929)
Course	4
Term	1
Credits count	5
Lectons	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 considers the system of labor safety standards. Legislative framework for safety and labor protection. Industrial sanitation. Fire safety. Means of protection and safety devices. Occupational safety at nuclear power plants. Safety precautions: when working with low-boiling liquefied gases and pressurized systems; when working on heat engineering installations; when working on electrical installations.

Purpose of studying of the discipline

Formation at students basic Knowing on labor protection, allowing to conduct independent work on the organization of safety and health conditions at work.

Learning Outcomes

ON2 Apply laws and regulations in the field of economics and law, ecology and life safety, as well as the skills of entrepreneurship, leadership, and receptivity of innovations.

ON4 Apply in the educational, scientific and professional activities the requirements of the rules and standards of documentation.

ON8 Use the rules of work organization with compliance with safety requirements on the basis of the relevant legislative and regulatory framework in the field of labor protection, radiation safety, fire safety in the energy sector.

Prerequisites

Bases of economics, law and ecological knowledge

Postrequisites

Final examination

Spectrometry radiation and methods of recording radiation

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28110 (3012959)
Course	4
Term	1
Credits count	5
Lectons	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 introduces and also expands students` knowledge of radiation spectrometry on the basic concepts of radiometry, spectrometry and dosimetry of nuclear radiation, as well as methods for detecting radiation using semiconductor, scintillation, and gas-discharge detectors, and characteristics of recording systems. Mass spectrometry methods; problems of obtaining and recording spectra. Infrared (IR) spectra and Raman scattering of light; methods of electron spectroscopy.

Purpose of studying of the discipline

Introduction to modern scientific equipment, the main types of dosimeters, radiometers, spectrometers and other equipment used in radiation physics, ecology and biology.

Learning Outcomes

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Introduction to Medical Physics Nuclear research reactors Theoretical Foundations of spectrometry

Postrequisites

Final examination

Physics of radiation protection

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28112 (3012960)
Course	4
Term	1
Credits count	5
Lectons	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 "Physics of Radiation Protection" is a course that deals with: issues of the impact of ionizing radiation on humans and the environment; methods for calculating protection against gamma and neutron radiation; basic regulatory documents on radiation safety when working with sources of ionizing radiation and in the design, construction and operation of nuclear power plants.; methods of registration of ionizing radiation; organization of the radiation safety system at nuclear power plants.

Purpose of studying of the discipline

Formation of the student basic Knowing of protection against ionizing radiation.

Learning Outcomes

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Applied physics and radiation safety Nuclear research reactors

Postrequisites

Final examination

Radiometry

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28143 (3012958)
Course	4
Term	1
Credits count	5
Lectons	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 "Radiometry" aims to familiarize students with the physical foundations of the interaction of radiation with matter, methods of their registration; with the basics of radiometry methods, their capabilities and tasks to be solved. Brief description of the properties of radioactive radiation. Theoretical foundations of radiometry. Classification of methods of radiometric measurements. Methods of radiometric measurements.

semiconductor counters. Optical methods. radiography method. Fundamentals of activation analysis. Application of radiometric methods for the analysis of ores, concentrates, salts.

Purpose of studying of the discipline

The fundamental study of the foundations of radiometry and their application in the nuclear industry.

Learning Outcomes

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Applied physics and radiation safety Energyequipment NEI Nuclear research reactors

Postrequisites

Final examination

Module 8. Establishment of calculation methods and selection of equipment for nuclear power, non-traditional and renewable energy

Alternative and renewable energy sources

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28067 (3012941)
Course	3
Term	1
Credits count	5
Lectons	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 " Alternative and renewable energy sources " studies: to satisfy a person in the needs of energy from non-traditional sources. Wind power installations. Physical bases of processes of transformation of solar energy at use of energy of the Sun. The use of agricultural and industrial waste, and the possibility of their use as primary sources for the production of heat and electricity. Geothermal energy, thermal regime of the earth`s crust.

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 engineering production.

Learning Outcomes

ON2 Apply laws and regulations in the field of economics and law, ecology and life safety, as well as the skills of entrepreneurship, leadership, and receptivity of innovations.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics History of the development of energy Basics of Alternative Energy

Postrequisites

Basic and profile disciplines of the EP Final examination Basics of Heat Transformation Heat and mass transfer in power plants Heat pumps

Energyequipment NEI

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28065 (3012935)
Course	3
Term	1
Credits count	5
Lectons	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 purpose of studying the discipline " Energy equipment NEI " of devices and elements of nuclear power plants, as well as the characteristics of technological schemes of nuclear power plants, thermal schemes of nuclear power plants, power cycles of plants and efficiency factors, steam and gas turbines, pumps and gas blowers, working fluids and coolants , heat exchangers and steam generators, structural diagrams and optimization of equipment parameters.

Purpose of studying of the discipline

Formation of basic information on the purpose, composition and principles of operation of the main power equipment of nuclear power plants.

Learning Outcomes

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

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics Thermodynamics Heat and Mass Transfer Elementaric particle Physics

Postrequisites

Basic and profile disciplines of the EP Final examination

Nuclear research reactors

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28090 (3012938)
Course	3
Term	2
Credits count	5
Lectons	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 and term work/Project

Short description of discipline

Classification Yair. Physical characteristics of heat transfer and hydrodynamics YaR. Fizicheskie osnovy proektirovaniya. Osobennosti Yair. Physics some Yair. Design and technological schemes. The experimental setup materialovedcheskih reactors. Loop setup. Development trends Yair. Research nuclear reactors play an important role in the development of nuclear technology.

Purpose of studying of the discipline

The theoretical and practical preparation of students for work related to the study of the fundamental and comprehensive schemes of individual elements and plants in general.

Learning Outcomes

ON7 Apply laws describing the flow of physical processes in the microworld, the mathematical apparatus of non-relativistic quantum mechanics, methods for calculating the physical properties of materials, assessing the applicability of approximations in educational, research and practical activities.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics The nuclear and neutron physics Neutron transport theory Theoretical Foundations of spectrometry Atomic physics The physics of the atom and atomic phenomena Elementaric particle Physics Nuclear physics

Postrequisites

Basic and profile disciplines of the EP Final examination ACS processes NPI

ACS processes NPI

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28137 (3012945)
Course	4
Term	1
Credits count	5
Lectons	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 " ACS processes NPI " studies Emergency protection and signaling systems, types of emergency situations and main signals, protection by power level and acceleration period, emergency and warning signaling. Reactor power control. The main elements and their characteristics classification of control systems of automatic control systems. Reactor power control and power distribution system description of the reactor as a control object and thermal control.

Purpose of studying of the discipline

Training of specialists in the field of automated process control systems at nuclear power plants and nuclear power units.

Learning Outcomes

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

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Elements of computer graphics and CAD bases in technical physics Energyequipment NEI Nuclear research reactors Electrical engineering and electronics

Postrequisites

Final examination

Fundamentals of reactor physics

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28115 (3012937)
Course	4
Term	1
Credits count	5
Lectons	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 "Fundamentals of Reactor Physics" introduces students to a number of ideas, models and concepts used in nuclear reactor physics. It is also devoted to the methods of experimental studies of the neutron field and the physical theory of reactors. Neutron-physical features and calculation of power reactors; theory of critical dimensions; lattice theory; physical classification of reactors; neutron multiplication factor; classification of experiments; neutronic characteristics determined in experiments on assemblies and reactors.

Purpose of studying of the discipline

Development representation of the physics of nuclear reactors.

Learning Outcomes

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

The nuclear and neutron physics Neutron transport theory Energyequipment NEI Nuclear research reactors Theoretical Foundations of spectrometry Atomic physics The physics of the atom and atomic phenomena Elementaric particle Physics Nuclear physics

Postrequisites

Final examination

Controlled thermonuclear fusion

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28132 (3012943)
Course	4
Term	1
Credits count	5
Lectons	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 "Controlled thermonuclear fusion" gives an idea about thermonuclear fusion, physical properties - plasma, about the energy of the future.

Binding energy of nuclei. division and synthesis. High temperature plasma. Tokamak-type installations. "Great ITER": estimation of parameters. Engineering issues of creating windings of the tokamak magnetic field. Plasma equilibrium. Grad-Shafranov equation. Ohmic plasma heating. The electromagnetic system of the tokamak. Toroidal magnetic system. Thermonuclear power reactor based on tokamak.

Purpose of studying of the discipline

Give an idea of thermonuclear synthesis, physical properties - plasma, about the future of energy.

Learning Outcomes

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

The nuclear and neutron physics Neutron transport theory Energyequipment NEI Nuclear research reactors Atomic physics The physics of the atom and atomic phenomena Elementaric particle Physics Nuclear physics

Postrequisites

Final examination

Nuclear fuel cycle

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28141 (3012947)
Course	4
Term	1
Credits count	6
Lectons	15hours
Practical and seminar classes	30hours
Laboratory works	15hours
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 "Nuclear Fuel Cycle" studies Ensuring radiation safety at different stages of the fuel cycle, environmental consequences, and the potential danger of technological processes of nuclear energy. Decommissioning of a nuclear power plant: dismantling, conservation, nuclear power and public opinion. Impact of a nuclear power plant on the environment. Fuel handling: radioactive waste, problems of their disposal and disposal, uranium-thorium, plutonium fuel.

Purpose of studying of the discipline

Systematics of the main problems of the nuclear fuel cycle, a comparative evaluation of economic and environmental aspects of nuclear energy.

Learning Outcomes

ON2 Apply laws and regulations in the field of economics and law, ecology and life safety, as well as the skills of entrepreneurship, leadership, and receptivity of innovations.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Energyequipment NEI Nuclear research reactors

Postrequisites

Final examination

Module 9. Substantiation of calculation methods and selection of equipment for the production of cold, ventilation and air conditioning systems

Air conditioning and ventilation

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28068 (3012948)
Course	3
Term	1
Credits count	5
Lectons	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 "Air conditioning and ventilation" studies air purification devices, air distribution systems, calculation and selection of air ducts, fans, calculation of system performance, microclimate, heat and humidity balances of air-conditioned rooms, heat exchangers for heat and moisture treatment of air, devices for contact type heat and moisture treatment of air, and to control the amount of air, the main parameters of air, air conditioning systems, processing processes.

Purpose of studying of the discipline

The study of student basic and fundamental tenets of the theory and practical calculations of modern air conditioning systems, taking into account the relationship of air conditioning systems and cooling systems.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics Fluid Dynamics Thermodynamics Heat and Mass Transfer

Postrequisites

Basic and profile disciplines of the EP Final examination Refrigerators Heat pumps

Chillers

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28066 (3012940)
Course	3
Term	1
Credits count	5
Lectons	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 " Chillers " studies the theory of refrigeration machines and the design of their elements in general and work processes. Properties of working substances of low-temperature systems. Cycles of gas refrigeration machines, absorption, vapor compression, and heat pumps. Operating characteristics of compressors; dynamics of reciprocating machines. Methods of thermal and gas-dynamic calculation of the main types of apparatuses, Capacitors. Evaporators. Classification of gas refrigeration machines. hardware units.

Purpose of studying of the discipline

The study of business processes and the theory of refrigerators, con constructions of elements and machines in general.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics Technical Mechanics Fluid Dynamics Thermodynamics Heat and Mass Transfer

Postrequisites

Basic and profile disciplines of the EP Final examination Refrigerators Bases for design and construction of refrigerating machines with elements of CAD Installation, diagnostics and repair of refrigeration equipment Heat pumps

Refrigerators

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28093 (3012939)
Course	3
Term	2
Credits count	5
Lectons	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 and term work/Project

Short description of discipline

The discipline " Refrigerators " studies: Rational design of refrigeration units with the development of modern refrigeration systems. Types of refrigeration units in food and other industries. Cooling methods. Schemes and cycles of refrigeration units. Scope and properties of coolants. Calculation and selection of the main and auxiliary equipment. Varieties of refrigeration units according to their features, according to which their field of application is selected. Refrigeration transport. Small refrigeration units.

Purpose of studying of the discipline

The study of the basic and fundamental provisions of the rational design of refrigeration systems, given the current development of refrigeration.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Thermodynamics Heat and Mass Transfer Chillers

Postrequisites

Basic and profile disciplines of the EP Final examination

Automation of refrigeration

Discipline cycle	Profiling discipline
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Discipline component	Electives
SubjectID	28135 (3012944)
Course	4
Term	1
Credits count	5
Lectons	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 study of the discipline " Automation of refrigeration " students are the devices, the principles of operation of the main means of automation, the basics of automatic control and regulation of the operation of the refrigeration unit, and air conditioning systems. Regulation of operation and parameters of refrigeration machines and installations. Establishing the boiling point in the evaporator of refrigeration machines. Automation of refrigeration machines and installations. Building the characteristics of the refrigeration machine. Smooth and step-toe (positional) regulation of cooling capacity.

Purpose of studying of the discipline

The study of the students unit, the operating principle of the basic means of automation, fundamentals of automatic control and regulation of the refrigeration plant and air conditioning systems.

Learning Outcomes

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

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Elements of computer graphics and CAD bases in technical physics Refrigerators Chillers Electrical engineering and electronics

Postrequisites

Final examination

Installation, diagnostics and repair of refrigeration equipment

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28139 (3012946)
Course	4
Term	1
Credits count	6
Lectons	15hours
Practical and seminar classes	30hours
Laboratory works	15hours
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 " Installation, diagnostics and repair of refrigeration equipment " gives an idea. When carrying out installation work, preparatory work on planning and preparation of technical documentation. Installation of pipelines. Safety precautions during all stages of installation work. Start-up and commissioning of the refrigeration unit. Safety precautions during repair work. Delivery of the freon refrigeration unit after installation and operation.

Purpose of studying of the discipline

Preparation of students for industrial and technical activities-sti-related diagnostics, repair, installation, service and efficient operation of refrigeration equipment.

Learning Outcomes

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

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Refrigerators Chillers Air conditioning and ventilation Heat pumps

Postrequisites

Final examination

Bases for design and construction of refrigerating machines with elements of CAD

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28131 (3012942)

Course	4
Term	1
Credits count	5
Lectures	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 " Bases for design and construction of refrigerating machines with elements of CAD " gives skills in performing design and research work on designing based on CAD tools and designing and calculating typical elements of modern refrigeration machines. Heat exchangers of the type "mixing-mixing", "mixing-displacement", "displacement-displacement" and their mathematical models. General methods for calculating reciprocating compressors. Basic construction materials.

Purpose of studying of the discipline

To equip students with the skills of designing and calculating the typical elements of modern machines and refrigerators perform computational research work on the design based on CAD tools.

Learning Outcomes

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

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Physics Mathematics Technical Mechanics Fluid Dynamics Elements of computer graphics and CAD bases in technical physics Refrigerators Chillers

Postrequisites

Final examination

The basic technology of production of consumers of artificial cold

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28114 (3012936)
Course	4
Term	1
Credits count	5
Lectures	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 " The basic technology of production of consumers of artificial cold " studies in obtaining theoretical knowledge in the field of the use of artificial cold. Drying. Cooling. Desorption. Absorption. Condensation. Rectification. Crystallization. Adsorption. Sublimation drying. Technological processes of chemical and food industries, their classification. Composition and properties of chemicals and food products. Regularities of chemical, physical transformations of substances. In the field of chemical and food industries, the use of artificial cold.

Purpose of studying of the discipline

Providing deep theoretical Knowing and practical experience in the application of artificial cold.

Learning Outcomes

ON5 Use the fundamental laws of mechanics, thermodynamics, heat and mass transfer and their practical applications.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Refrigerators Chillers

Postrequisites

Final examination

Module 10. Conducting a feasibility study of the efficiency of energy systems in the field of high and low temperatures, energy-saving equipment

Economics of enterprise

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	28113 (3012965)
Course	4

Term	1
Credits count	3
Lectures	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

ON10 Проводить технико-экономические обоснования эффективности работы энергетических систем в области высоких и низких температур, энергосберегающего оборудования с использованием необходимых материалов действующих производств.

Prerequisites

Bases of economics, law and ecological knowledge

Postrequisites

Final examination

Prediploma practice

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28150 (3012886)
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

ON8 Use the rules of work organization with compliance with safety requirements on the basis of the relevant legislative and regulatory framework in the field of labor protection, radiation safety, fire safety in the energy sector.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

ON10 Проводить технико-экономические обоснования эффективности работы энергетических систем в области высоких и низких температур, энергосберегающего оборудования с использованием необходимых материалов действующих производств.

Prerequisites

Manufacturing practice II

Postrequisites

Final examination

Manufacturing practice III

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	28153 (3012968)
Course	4
Term	2
Credits count	15
Working practice	450hours
Total	450hours

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 «Technical physics».

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

ON8 Use the rules of work organization with compliance with safety requirements on the basis of the relevant legislative and regulatory framework in the field of labor protection, radiation safety, fire safety in the energy sector.

ON9 To substantiate the methods of calculation and selection of equipment for the nuclear industry, alternative and renewable energy for the production of cold, ventilation and air conditioning systems based on the achievements of science and technology.

Prerequisites

Manufacturing practice II

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 «6B05303 - Technical physics»

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 2. Application in cognitive and professional activities of basic knowledge in the field of mathematics and physics										
Mathematics	BS/US	1	5	150	15	30		35	70	Examination
Physics	BS/US	1	3	90	15	15	0	20	40	Examination
Module 3. Application in educational, scientific and professional activities of the requirements to the graduate										
Introduction to Specialty	BS/CCh	1	3	90	15	15		20	40	Examination
History of the development of energy	BS/CCh	1	3	90	15	15		20	40	Examination
Basics of Alternative Energy	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. Application of fundamental laws of mechanics, thermodynamics and heat exchange										
Theoretical basics of heat engineering	BS/CCh	3	5	150	15	15	15	35	70	Examination
Heat engineering	BS/CCh	3	5	150	15	15	15	35	70	Examination
Thermodynamics	BS/CCh	3	5	150	15	15	15	35	70	Examination
Technical Mechanics	BS/US	3	5	150	15	30		35	70	Examination
Fluid Dynamics	BS/US	4	5	150	15	30		35	70	Examination
Heat and Mass Transfer	BS/CCh	4	5	150	15	30		35	70	Examination and term work/Project
Heat and mass transfer processes and apparatuses thermotehnologi	BS/CCh	4	5	150	15	30		35	70	Examination and term work/Project
Chemical thermodynamics	BS/CCh	4	5	150	15	30		35	70	Examination and term work/Project
Module 5. Operation of knowledge in the field of electrical engineering, electronics and information technology										
Computer technologies in the energy sector	BS/CCh	3	5	150	15	15	15	35	70	Examination
Simulation of the electric	BS/CCh	3	5	150	15	15	15	35	70	Examination
Applied Electronics	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
Elements of computer graphics in technical physics	BS/CCh	3	5	150	15	15	15	35	70	Examination
Elements of computer graphics and CAD bases in technical physics	BS/CCh	3	5	150	15	15	15	35	70	Examination
Module 6. Application of physical laws in educational, research and practical activities										
Applied Optics	BS/CCh	3	3	90	15	15	0	20	40	Examination
Elementaric particle Physics	BS/CCh	3	3	90	15	15	0	20	40	Examination
Nuclear physics	BS/CCh	3	3	90	15	15	0	20	40	Examination
Introduction to Medical Physics	BS/CCh	4	5	150	15	30		35	70	Examination
Molecular Physics and Thermodynamics	BS/CCh	4	5	150	15	30		35	70	Examination
Applied Thermal Physics	BS/CCh	4	5	150	15	30		35	70	Examination
Manufacturing practice I	BS/US	4	5	150						Total mark on practice
Statistical physics and thermodynamics	BS/CCh	4	5	150	15	30		35	70	Examination
Neutron transport theory	BS/CCh	4	5	150	15	30		35	70	Examination
The nuclear and neutron physics	BS/CCh	4	5	150	15	30		35	70	Examination
Atomic physics	BS/CCh	5	5	150	15	30		35	70	Examination
Theoretical Foundations of spectrometry	BS/CCh	5	5	150	15	30		35	70	Examination
The physics of the atom and atomic phenomena	BS/CCh	5	5	150	15	30		35	70	Examination
Physics of the condensed state	BS/CCh	5	5	150	15	30		35	70	Examination
Physics of semiconductors and dielectrics	BS/CCh	5	5	150	15	30		35	70	Examination

Solid state physics	BS/CCh	5	5	150	15	30		35	70	Examination
Computational methods in quantum physics	BS/CCh	6	5	150	15	30		35	70	Examination
Quantum mechanics	BS/CCh	6	5	150	15	30		35	70	Examination
Quantum mechanics of molecules	BS/CCh	6	5	150	30	15		35	70	Examination
Introduction to scientific activity	AS/US	7	3	90	15	15		20	40	Examination
Module 7. Using the legislative and regulatory framework to organize work in compliance with safety requirements										
Applied physics and radiation safety	BS/CCh	5	5	150	15	15	15	35	70	Examination
Principles of nuclear safety	BS/CCh	5	5	150	15	15	15	35	70	Examination
Radioecology and radiation safety	BS/CCh	5	5	150	15	15	15	35	70	Examination
Information technology and tech-niques in engineering education	BS/CCh	6	5	150	15	30		35	70	Examination
Basics of modern energy in English	BS/CCh	6	5	150	15	30		35	70	Examination
Basics of Heat Transformation	BS/CCh	6	5	150	15	15	15	35	70	Examination
Manufacturing practice II	BS/US	6	5	150						Total mark on practice
Heat pumps	BS/CCh	6	5	150	15	15	15	35	70	Examination
Heat and mass transfer in power plants	BS/CCh	6	5	150	15	15	15	35	70	Examination
Formation of the technical thesaurus	BS/CCh	6	5	150	15	30		35	70	Examination
Basics cryosystems	AS/CCh	6	5	150	15	30		35	70	Examination
Processes and equipment of cooling gas	AS/CCh	6	5	150	15	30		35	70	Examination
Thermophysical processes in cryogenic systems	AS/CCh	6	5	150	15	30		35	70	Examination
Specifications and technical documentation on labor protection	BS/CCh	7	5	150	15	30		35	70	Examination
Occupational Safety and Health	BS/CCh	7	5	150	15	30		35	70	Examination
Occupational health and safety in the Technical Physics	BS/CCh	7	5	150	15	30		35	70	Examination
Spectrometry radiation and methods of recording radiation	BS/CCh	7	5	150	15	15	15	35	70	Examination
Physics of radiation protection	BS/CCh	7	5	150	15	15	15	35	70	Examination
Radiometry	AS/CCh	7	5	150	15	15	15	35	70	Examination
Module 8. Establishment of calculation methods and selection of equipment for nuclear power, non-traditional and renewable energy										
Alternative and renewable energy sources	AS/CCh	5	5	150	15	30		35	70	Examination
Energyequipment NEI	AS/CCh	5	5	150	15	30		35	70	Examination and term work/Project
Nuclear research reactors	AS/CCh	6	5	150	15	15	15	35	70	Examination and term work/Project
ACS processes NPI	AS/CCh	7	5	150	15	30		35	70	Examination
Fundamentals of reactor physics	AS/CCh	7	5	150	15	30		35	70	Examination
Controlled thermonuclear fusion	AS/CCh	7	5	150	15	30		35	70	Examination

Nuclear fuel cycle	AS/CCh	7	6	180	15	30	15	40	80	Examination
Module 9. Substantiation of calculation methods and selection of equipment for the production of cold, ventilation and air conditioning systems										
Air conditioning and ventilation	AS/CCh	5	5	150	15	30		35	70	Examination
Chillers	AS/CCh	5	5	150	15	30		35	70	Examination
Refrigerators	AS/CCh	6	5	150	15	15	15	35	70	Examination and term work/Project
Automation of refrigeration	AS/CCh	7	5	150	15	30		35	70	Examination
Installation, diagnostics and repair of refrigeration equipment	AS/CCh	7	6	180	15	30	15	40	80	Examination
Bases for design and construction of refrigerating machines with elements of CAD	AS/CCh	7	5	150	15	30		35	70	Examination
The basic technology of production of consumers of artificial cold	AS/CCh	7	5	150	15	30		35	70	Examination
Module 10. Conducting a feasibility study of the efficiency of energy systems in the field of high and low temperatures, energy-saving equipment										
Economics of enterprise	BS/US	7	3	90	15	15		20	40	Examination
Prediploma practice	AS/CCh	8	15	450						Total mark on practice
Manufacturing practice III	AS/CCh	8	15	450						Total mark on practice
Final examination										
Diploma project		8	8	240						
Comprehensive exam		8	8	240						