NJSC SHAKARIM UNIVERSITY OF SEMEY

EDUCATIONAL PROGRAM

7M07 - Engineering, Manufacturing and Civil engineering
(Code and classification of the field of education)

7M071 - Engineering and engineering trades
(Code and classification of the direction of training)

0710
(Code in the International Standard Classification of Education)

M098 - Heat Power Engineering
(Code and classification of the educational program group)

7M07101 - Heat Power Engineering
(Code and name of the educational program)

Master
(Level of preparation)

Semey

Educational program

7M07 - Engineering, Manufacturing and Civil engineering
(Code and classification of the field of education)

7M071 - Engineering and engineering trades
(Code and classification of the direction of training)

0710
(Code in the International Standard Classification of Education)

M098 - Heat Power Engineering
(Code and classification of the educational program group)

7M07101 - Heat Power Engineering
(Code and name of the educational program)

Master
(Level of preparation)

Semey 2023

PREFACE

Developed

The educational program 7M07101 - Heat Power Engineering in the direction of preparation 7M071 - Engineering and engineering trades on the basis of the State Compulsory Standards of Higher and Postgraduate Education approved by the Order of the Ministry of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No 2 (as amended by the order) was developed by the Academic Committee dated 20.02.2023 No 66).

Members of the Academic Committee	Full name	Academic degree, academic title, position	Signature
Head of the Academic Committee	Nurymkhan Gulnur	Dean of the engineering-technological faculty, PhD	
Educational program manager	Stepanova Olga	Head of the Department of Technical Physics and Thermal Power Engineering	
Member of the AC	Yermolenko Mikhail	Candidate of technical sciences, senior lecturer of the Department of Technical Physics and Thermal Power Engineering	
Member of the AC	Kassymov Askar	PhD, acting ass. professor of the Department of Technical Physics and Thermal Power Engineering	
Member of the AC	Demin Nikolay	Deputy Director for the Production of the State Communal Enterprise "Teplokomunenergo"	
Member of the AC	Chektybayev Baurzhan	PhD, Head of Thermonuclear Studies Department of IAE RSE NNC RK	
Member of the AC	Yesengeldinov Abylai	master s student of the group MTE-101	
Member of the AC	Bakyt Zhanel	master s student of the group MTE-201	

Reviewing

Full name of the reviewer	Position, place of work	Signature
Mukhamedov Nurzhan	Head of the Department for Development and Testing of Reactor Devices of the Branch of the IAE RSE NNC RK	

Reviewed

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

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

Approved

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

Content

1.Introduction

1.1.General data

Training in the educational program 7M07101- Heat Power Engineering is carried out at the Shakarim State University of Semey at the Department of “Technical Physics and Heat Power Engineering” of the Faculty of Engineering and Technology. The implementation of the educational program considers the particularity of the training of undergraduates, typical for the Shakarim State University of Semey and for the local region.

1.2.Completion criteria

The main criterion for the completion of the educational process for the preparation of masters of the scientific and pedagogical direction is the development of at least 88 credits of theoretical training, including 6 credits of pedagogical practice, 13 credits of research practice, as well as at least 24 credits of research work of a master`s student, including internships and the completion of a master`s thesis, at least 8 credits of the final attestations . A total of 120 credits.

1.3.Typical study duration: 2 years

2.PASSPORT OF THE EDUCATIONAL PROGRAM

2.1.EP purpose	Preparation of competitive specialists with deep modern knowledge in the field of heat power engineering, including in the fuel and energy sector, in the field of production, transformation and transportation of thermal energy
2.2.Map of the training profile within the educational program	
Code and classification of the field of education	7M07 - Engineering, Manufacturing and Civil engineering
Code and classification of the direction of training	7M071 - Engineering and engineering trades
Code in the International Standard Classification of Education	0710
Code and classification of the educational program group	M098 - Heat Power Engineering
Code and name of the educational program	7M07101 - Heat Power Engineering
2.3.Qualification characteristics of the graduate	
Degree awarded / qualification	Master of Technical Sciences under the educational programme 7M07101-Heat Power Engineering
Name of the profession / list of positions of a specialist	Design engineer, junior researcher, senior laboratory assistant, teacher at college or university.
OQF qualification level (industry qualification framework)	7
Area of professional activity	Industry, energy industry, education, science.
Object of professional activity	Factors and firms of energy and technological profiles. Research institutions. Higher and secondary specialized educational institutions. Design institutes.
Types of professional activity	Scientific research. Production and technology. Organization and management. Operation. Project-based. Education (pedagogical).
Graduate Model	Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activities. To form the strategy and structure of the organization of scientific research and mathematical modeling of thermal power facilities. To operate with the necessary calculation methods of cogeneration and ventilation heat technology plants. To develop measures for safe operation and research on modern NPPs, engineering networks and equipment. To evaluate traditional and non-traditional energy conversion methods. To develop schemes for modern heat and nanotechnology plants. To consider the thermophysics of phase transformations and material properties. To justify methods for measuring emissions and material properties for modern nuclear energy.

	To develop innovations in heat and power engineering and cryogenic engineering. To outline the problems and prospects for the development of heating and cooling equipment.

3.Modules and content of the educational program

Sociolinguistic and scientific-pedagogical activity

Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activities.

Foreign language (professional)

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	30262 (3010764)
Course	1
Term	1
Credits count	3
Practical and seminar classes	30hours
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

Mastery of general cultural, professional and special competencies for the implementation of professional activities, involving teaching free reading of original literature of the relevant branch of knowledge in a foreign language; development of oral communication skills in monological and dialogical form in the specialty; development of written scientific communication skills on topics related to the scientific work of a graduate student, as well as familiarization with the forms and types of international cooperation in the scientific field.

Purpose of studying of the discipline

The purpose of studying the discipline "Foreign language (professional)" in the master`s degree program is the systematic deepening of communicative competence within the framework of international standards of foreign language education on the basis of further development of skills and abilities of active language proficiency in the professional activity of the future master.

Learning Outcomes

ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activities.

Prerequisites

Bachelor

Postrequisites

Final examination

History and philosophy of science

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	30263 (3010765)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at studying the culture of scientific thinking, forms analytical capabilities and research skills, provides theoretical and practical knowledge necessary for a future scientist. Explores the historical evolution of the sciences and the philosophical perspectives they form. The origins of modern science, its social and institutional connections are described. General philosophical issues related to thought experiments, confirmation and refutation of theories, the origin and application of quantitative and high-quality research methods are considered.

Purpose of studying of the discipline

the formation of an interdisciplinary worldview among undergraduates, based on a deep understanding of the history and philosophy (theory) of scientific thinking, as part of a universal culture.

Learning Outcomes

ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activities.

Prerequisites

Bachelor

Postrequisites

Final examination

Tertiary education

Discipline cycle	Basic disciplines
Discipline component	University component

SubjectID	30264 (3010766)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
The course is aimed at studying the main directions, principles and patterns of higher education. During the course of the course, the basic concepts of modern pedagogy, concepts and theories of teaching and upbringing, didactics of higher education will be considered. The master`s student will master the skills of designing the organization of the educational process, techniques of individual and group reflection, will be able to correctly formulate pedagogical goals, apply educational technologies in the educational process. in the process, to design work programs of disciplines.

Purpose of studying of the discipline
The purpose of mastering the discipline is to master the system of knowledge about higher education, its content, structure, principles of educational process management and mastering modern technologies in the field of management and organization of the educational process

Learning Outcomes
ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activities.

Prerequisites
Bachelor

Postrequisites
Pedagogical practice

Psychology of management

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	30261 (3010763)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
The content of the course is aimed at mastering the approaches and directions of management psychology, psychological laws of management, features of planning and solving management problems. Students will get acquainted with the psychological methods of resolving conflict situations, master the ways of motivating work, the methods of using effective management styles. Skills will be formed to analyze the psychological causes underlying the decline in the effectiveness of the management process.

Purpose of studying of the discipline
The purpose of the discipline "Psychology of Management" is the formation of scientifically based ideas about the system of mental phenomena, psychological variables of behavior and conscious human activity in modern conditions and allows undergraduates to form skills of applying the acquired psychological knowledge in educational activities

Learning Outcomes
ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activities.

Prerequisites
Bachelor

Postrequisites
Final examination

Pedagogical practice

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	30278 (3010727)
Course	2
Term	1
Credits count	6
Pedagogical practics	180hours
Total	180hours

Knowledge control form	Total mark on practice

Short description of discipline
The pedagogical practice of the undergraduate is an important practical component of the second stage of higher education. This type of practice is aimed at mastering the basics of pedagogical skills, leading a group of students and developing educational and methodological material. The passage of pedagogical practice involves the formation of concepts about modern educational technologies, forms and methods of conducting classes, monitoring the assimilation of the studied material. Pedagogical practice contributes to the development of undergraduates` self-analysis skills based on the results of the work done.

Purpose of studying of the discipline
The purpose of teaching practice is to study the basics of educational and methodical work and the formation of practical skills and methods of teaching in higher education.

Learning Outcomes
ON1 Apply fundamental scientific, pedagogical, managerial, communicative knowledge and skills in professional activities.

Prerequisites
Tertiary education

Postrequisites
Final examination

Модуль 2.Organization of scientific research and mathematical modeling of heat and power facilities

To form the strategy and structure of the organization of scientific research and mathematical modeling of thermal power facilities.

Information systems in heat power engineering and thermo technologies

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30249 (3010729)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course discusses the types of models and types of modeling. The issues of mathematical modeling of heat and mass transfer processes are analyzed in detail. The applicability of numerical methods in solving heat engineering problems and mathematical modeling and optimization of heat and mass transfer devices is studied. The features of mathematical modeling of heat technology installations and optimization of heat and power supply systems of industrial enterprises are discussed. The possibilities of application software packages for automation of the scientific research system are considered.

Purpose of studying of the discipline
Formation at undergraduates knowledge and skills of computer technology, methods of modeling and optimization of thermal power and thermal technological processes, plants and systems.

Learning Outcomes
ON2 To form the strategy and structure of the organization of scientific research and mathematical modeling of thermal power facilities.

Prerequisites
Bachelor

Postrequisites
Final examination

Scientific research methodology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30258 (3010762)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course describes in detail the methodological support of research activities. The role of the functional structure of research activity is shown. Empirical and theoretical thinking in scientific cognition is analyzed. The confirmations and refutations of theoretical schemes are formulated and substantiated. The functional features of experimental modeling are generalized. An explanation of the growth of scientific knowledge is given. The importance of functional and procedural characteristics of hypotheses and their scientific novelty is shown.

Purpose of studying of the discipline

To form in students the principles and methods of organizing scientific research.

Learning Outcomes

ON2 To form the strategy and structure of the organization of scientific research and mathematical modeling of thermal power facilities.

Prerequisites

Bachelor

Postrequisites

Final examination

Organization and planning of scientific research

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30255 (3010756)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course is devoted to the organization and planning of scientific research. The methodological foundations of scientific knowledge and creativity are outlined. The choice of the direction of scientific research and the development of stages of research work are highlighted. The requirements for the search, accumulation and processing of scientific information are considered. The principles of theoretical and experimental research are described. Modeling in scientific and technical creativity has been analyzed. The methods of processing the results of experimental studies are generalized. The requirements for the design of the results of scientific work are formulated.

Purpose of studying of the discipline

Development of elements of research methodology for the development of creative thinking and rational organization of optimal mental activity.

Learning Outcomes

ON2 To form the strategy and structure of the organization of scientific research and mathematical modeling of thermal power facilities.

Prerequisites

Bachelor

Postrequisites

Final examination

Basic scientific research

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	28038 (3010728)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course covers the organization of research work. The fundamentals of the methodology of scientific cognition are presented. The role of choosing the direction of research is noted, and the development of all stages of scientific research is described separately. The basics of work in the search, collection and processing of scientific and technical information are formulated. The classification of research methods is carried out. Attention is paid to the correct design and implementation of the results of the conducted research. The effectiveness of the organization of work in the scientific team is summarized.

Purpose of studying of the discipline

The preparation for scientific and technological, organizational and methodological activities related to scientific research.

Learning Outcomes

ON2 To form the strategy and structure of the organization of scientific research and mathematical modeling of thermal power facilities.

Prerequisites

Bachelor

Postrequisites

Final examination

Basics of CAD low potential energy

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30257 (3010757)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course discusses the goals and objectives of mathematical modeling of low-potential energy facilities. Frequently used methods of optimization of simulated objects, types of ideal models and the method of thermoeconomics are given. The main methods of modeling and dynamic optimization of refrigeration units and air conditioning systems are considered, taking into account seasonal changes in outdoor air temperature and the magnitude of loads. Attention is paid to computer-aided design systems.

Purpose of studying of the discipline

Development of the skill of research work in the field of refrigeration technology with the formulation and conduct of simulation experiments with models of heat and mass transfer processes occurring in heat exchangers of the refrigeration industry.

Learning Outcomes

ON2 To form the strategy and structure of the organization of scientific research and mathematical modeling of thermal power facilities.

Prerequisites

Bachelor

Postrequisites

Final examination

DBMS

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30239 (3010730)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course is dedicated to the field of application of databases. The basic concepts and data models are considered. The process and approaches of database design are analyzed. The creation and adjustment of the database is discussed. The principle of searching and ordering information stored in databases is given. The methods of output and analysis of information stored in databases are given. The technology of programming in a database management system is being studied.

Purpose of studying of the discipline

Mastering the basics of database theory, modern methods of database design, database design tools, familiarization with new directions with database technology.

Learning Outcomes

ON2 To form the strategy and structure of the organization of scientific research and mathematical modeling of thermal power facilities.

Prerequisites

Bachelor

Postrequisites

Final examination

Theory and Techniques of a scientific experiment

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30250 (3010731)

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

Short description of discipline
The course discusses in detail the methods of experiment planning. The possibilities of using single-factor, fractional factor and full factor experiments and rotatable plans in research are being studied. Optimization problems in extreme experiments are shown. Special measurement questions, error theory, mathematical statistics, probability theory and measuring instruments are considered. Methods and means of thermal measurements, thermal analysis, methods of experimental study of heat and mass transfer processes are generalized.

Purpose of studying of the discipline
Building knowledge and skills in the field of modern methods and means of scientific and industrial experiments

Learning Outcomes
ON2 To form the strategy and structure of the organization of scientific research and mathematical modeling of thermal power facilities.

Prerequisites
Bachelor

Postrequisites
Final examination

Theory and technique of heating experiment

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30253 (3010732)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course examines the elements of the theory of experimental planning, regression and static analysis. An overview of technical measurements and devices is given. The methods of experimental study of thermophysical properties of substances and processes of heat and mass transfer, methods and means of control of technical materials and metals of thermal power thermal technology installations are generalized. Methods of quality control of raw materials, fuels and products of heat-technological productions and metrological support of production and experimental research are presented.

Purpose of studying of the discipline
Mastering the basics of metrology and measurement technology, the formation of knowledge and skills in the field of modern methods and means of scientific and industrial experiments in the field of power and heat.

Learning Outcomes
ON2 To form the strategy and structure of the organization of scientific research and mathematical modeling of thermal power facilities.

Prerequisites
Bachelor

Postrequisites
Final examination

Experimental methods of physics research

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30254 (3010733)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours

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

Short description of discipline

This course discusses methods for creating and controlling pressures and temperatures during research and sources of electromagnetic and corpuscular radiation. Luminescent, resonant, electron-probe and ion-probe research methods are analyzed in detail. Methods of X-ray photoelectron spectroscopy (XPS), methods of surface investigation and X-ray diffraction studies are considered. The principle of operation and calibration of atomic power, scanning and transmission microscopy equipment is studied.

Purpose of studying of the discipline

Formation of theoretical and practical foundations of methods for studying the physical properties and characteristics of solids.

Learning Outcomes

ON2 To form the strategy and structure of the organization of scientific research and mathematical modeling of thermal power facilities.

Prerequisites

Bachelor

Postrequisites

Final examination

Модуль 3. Calculation methods of cogeneration and ventilation heat technology plants

To operate with the necessary calculation methods of cogeneration and ventilation heat technology plants. To evaluate traditional and non-traditional energy conversion methods.

Alternative energy sources

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30269 (3010736)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course analyzes the harmful effects on the environment during energy production. Solar and wind energy, small and micro-hydroelectric power plants are considered. The principle of operation of heat pump and bioenergy installations is studied. The types and main indicators of alternative fuels are discussed. The analysis of the state and prospects of using alternative fuels for vehicles is given. The main directions of the use of secondary energy resources are analyzed.

Purpose of studying of the discipline

Formation of principles for the use of alternative types of energy and methods of accumulation, in order to reduce the cost of energy consumed from traditional sources.

Learning Outcomes

ON5 To evaluate traditional and non-traditional energy conversion methods.

Prerequisites

Bachelor

Postrequisites

Final examination

High temperature thermal technological installation

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30271 (3010738)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course is devoted to the main types of industrial thermal and low-temperature processes, devices and installations. The issues of the physical nature of processes, characteristics of heat carriers and their features, regenerative and regenerative heat exchangers and heat technology reactors are considered. The features of mixing heat and mass transfer devices and installations are studied. The gasification of solid fuels, cracking and conversion of natural gas are being analyzed. Approaches to reducing energy consumption for the implementation of high-temperature heat-technological processes are discussed.

Purpose of studying of the discipline

Formation of special skills in the design, operation and research of high–temperature thermal engineering installations - one of the most capacious consumers of fuel and other energy resources in industry.

Learning Outcomes

ON6 To develop schemes for modern heat and nanotechnology plants.

Prerequisites

Bachelor

Postrequisites

Final examination

Measurement of thermophysical properties of materials

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30275 (3010742)
Course	1
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This discipline is devoted to the determination of thermophysical properties of materials. It discusses modern methods of studying thermophysical properties, experimental and theoretical methods. Methods of processing experimental studies to determine the thermophysical properties of materials are given. Experimental means and equipment for determining the thermophysical properties of various materials are being studied. The methods and analysis of error determination in the study of thermophysical properties of various materials are given.

Purpose of studying of the discipline

To generate knowledge about the mechanical, thermal, electrical, magnetic, and optical properties of materials to teach methods of thermo physical characteristics.

Learning Outcomes

ON7 To consider the thermophysics of phase transformations and material properties.

Prerequisites

Bachelor

Postrequisites

Final examination

Methods of thermal calculation

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30273 (3010740)
Course	1
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course discusses in detail the methods of conducting and equipping a thermophysical experiment, rules and methods for monitoring and measuring thermophysical and thermal parameters and properties. Stationary and non- stationary methods of determination and calculation of thermophysical characteristics and heat exchange processes are studied in detail. Non- destructive methods for studying the thermophysical characteristics of materials are analyzed and discussed. The method of calculating the absolute and relative error is given.

Purpose of studying of the discipline

Formation of an idea about the methods of conducting and equipping a thermophysical experiment, rules and methods for monitoring and measuring thermophysical and thermal parameters and properties.

Learning Outcomes
ON3 To operate with the necessary calculation methods of cogeneration and ventilation heat technology plants.
Prerequisites
Bachelor
Postrequisites
Final examination

The research work of a student, including an internship and the implementation of a master s thesis I

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	30276 (3010752)
Course	1
Term	2
Credits count	11
The research work	330hours
Total	330hours
Knowledge control form	Total mark on practice

Short description of discipline
Research work develops the ability to independently carry out activities in the field of education and science related to solving complex professional tasks in innovative conditions, ensuring the development of professional research thinking of undergraduates, forming a clear understanding of their main professional tasks, ways to solve them, conducting bibliographic work with the involvement of modern information technologies.

Purpose of studying of the discipline
Preparation of a master`s student for independent research work aimed at writing and defending a master`s thesis.
Learning Outcomes
ON2 To form the strategy and structure of the organization of scientific research and mathematical modeling of thermal power facilities.
ON3 To operate with the necessary calculation methods of cogeneration and ventilation heat technology plants.
Prerequisites
Bachelor
Postrequisites
The research work of a student, including an internship and the implementation of a masters thesis II

Scientific and technical problems in heat power engineering and thermo technologies

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	30277 (3010755)
Course	1
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course is devoted to the analysis of trends and patterns of energy development in the modern world. Special issues of the theory of combustion and special questions of heat and mass transfer are considered. Modern and promising methods and methods of obtaining and converting thermal and electrical energy are discussed. The analysis and prospects of using industrial waste and secondary energy resources as energy fuel and renewable energy sources are given.
Purpose of studying of the discipline
Training of a specialist to solve the problems of design, research and operation of thermal power and heat technology installations and systems, able to analyze the efficiency of energy conversion schemes, evaluate the prospects of new methods of energy production, put into practice innovative developments.
Learning Outcomes
ON3 To operate with the necessary calculation methods of cogeneration and ventilation heat technology plants.
Prerequisites
Bachelor
Postrequisites
Final examination

Basics of cogeneration

Discipline cycle	Profiling discipline

Discipline component	Electives
SubjectID	30238 (3010734)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
In this discipline, cogeneration plants and prospects for their use are considered. Power units based on gas piston engines (GPE), gas turbine, combined-cycle, solid fuel and biogas cogeneration plants are considered. The issues of cogeneration and small-scale energy at food industry and agriculture enterprises are considered. The idea of trigeneration and environmental problems in the production of thermal and electrical energy is given.

Purpose of studying of the discipline
Formation of knowledge of the basics of design, installation and operation of cogeneration plants.

Learning Outcomes
ON3 To operate with the necessary calculation methods of cogeneration and ventilation heat technology plants.

Prerequisites
Bachelor

Postrequisites
Final examination

Basics of nanotechnology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30272 (3010739)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course is devoted to the development trends of nanotechnology. Molecular beam epitaxy and chemical deposition from the gaseous phase are considered. Modern methods using scanning probes and scanning tunneling microscopy are given. Atomic force microscopy and atomic engineering are being studied. Probe methods for the formation of nanostructures and methods for the formation of nanoscale images are discussed. The features of self-regulating processes and the formation of nanostructured materials and coatings are analyzed in detail.

Purpose of studying of the discipline
Familiarization with the basic physical phenomena studied by nanotechnologies with the elements of the mathematical apparatus used by them.

Learning Outcomes
ON6 To develop schemes for modern heat and nanotechnology plants.

Prerequisites
Bachelor

Postrequisites
Final examination

Industrial ventilation

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30270 (3010737)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours

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

Short description of discipline
This course discusses the theoretical issues of ventilation. The classification of ventilation systems, the processes of changing the state of the air and its properties are given. The thermal regime of the premises is given. Harmful substances, explosive gases and vapors are described. The basics of the aerodynamics of the organization and calculation of air exchange in the room are given. Devices for heating and cleaning ventilation air, aeration of rooms, air curtains and the basics of air conditioning are being studied.

Purpose of studying of the discipline
The theoretical and practical training in the theory and practice of applied aerodynamics and thermal physics, ventilation and air conditioning, the basis of calculation, design, installation manual ventilation.

Learning Outcomes
ON3 To operate with the necessary calculation methods of cogeneration and ventilation heat technology plants.

Prerequisites
Bachelor

Postrequisites
Final examination

Modern methods of energy conversion

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30268 (3010735)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This discipline is devoted to the problem of obtaining and converting energy. Primary energy resources, mechanical, electrical, electromagnetic, chemical, nuclear energy, gravitational forces, power and flow energy are considered. An idea is given about the methods of heat energy transfer and the efficiency of a thermal piston engine. The complex use of thermal and electrical energy, problems of electromagnetic energy conversion, electrochemical energy storage and nuclear power plant are considered.

Purpose of studying of the discipline
Creation of knowledge bases of the problem of obtaining, transformation, transmission and energy storage.

Learning Outcomes
ON5 To evaluate traditional and non-traditional energy conversion methods.

Prerequisites
Bachelor

Postrequisites
Final examination

Phase transformations

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30274 (3010741)
Course	1
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This discipline is devoted to condensed systems. It gives the thermodynamics of phases and phase transitions in binary systems and considers the structure of condensed media. The issues of the statistical theory of phase transformations in binary solid solutions and the classification of phase transitions are analyzed. Model theories of phase transformations and phase transformations in the solid state are given. Experimental methods for studying phase transitions in condensed media are being studied.

Purpose of studying of the discipline

Formation of systematized ideas about various types of structural-phase transformations and patterns that determine the structure and properties of materials depending on their composition and processing conditions.

Learning Outcomes

ON7 To consider the thermophysics of phase transformations and material properties.

Prerequisites

Bachelor

Postrequisites

Final examination

Safe operation and research activities in nuclear power plants, engineering networks and equipment

To develop measures for safe operation and research on modern NPPs, engineering networks and equipment. To outline the problems and prospects for the development of heating and cooling equipment.

Atomic power stations

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30286 (3010749)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

TThis course covers energy resources and the production of electrical energy. The criteria for the selection of steam parameters at nuclear power plants with regenerative heating of feed water and water coolant are disclosed. The description of the steam generator plant of a nuclear power plant with PWPR and a reactor plant with a water coolant is given. The issues of technical water supply and layout of NPP equipment are considered. Ventilation and decontamination installations and thermal schemes are considered. Nuclear power plant.

Purpose of studying of the discipline

The theoretical and practical skills related to the choice of parameters and the type of equipment in the design and operation of nuclear power plants and AST in the power in stationary, transient and accident conditions.

Learning Outcomes

ON4 To develop measures for safe operation and research on modern NPPs, engineering networks and equipment.

Prerequisites

Bachelor

Postrequisites

Final examination

Engineering systems, networks and equipment

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30283 (3010746)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course is dedicated to engineering systems of settlements and industrial enterprises. It discusses the classification of engineering systems, water supply, sewerage systems and schemes, and solid and household waste. The issues of heat supply, gas supply, ventilation and air conditioning are being studied. Household gas installations and power supply issues are being investigated. General information on electrical safety is given. Transport, information systems, computer, radio and television networks are considered.

Purpose of studying of the discipline

Theoretical and practical preparation for work related to calculations, design, construction, manufacture, installation and operation of engineering systems.

Learning Outcomes

ON4 To develop measures for safe operation and research on modern NPPs, engineering networks and equipment.

Prerequisites

Bachelor

Postrequisites

Final examination

Innovative heat technologies in heat power engineering

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30284 (3010747)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course examines thermal, waste- free technologies and thermal, technological and functional schemes in modern industrial production. Economic and environmental analyses of heat-technological processes and criteria for environmental assessment of low-waste heat technologies are given, as well as ways to increase the efficiency of energy use in existing heat-technological processes. The analysis of the effective use of energy and material resources, as well as energy consumption maps in the heat technology complex is given.

Purpose of studying of the discipline

Development of expertise in the field of energy and resource problems arising in the establishment and operation of innovative thermal technological systems.

Learning Outcomes

ON9 To develop innovations in heat and power engineering and cryogenic engineering.

Prerequisites

Bachelor

Postrequisites

Final examination

Cryogenic technique

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30285 (3010748)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

In this discipline, the scope of application, physical research and properties of cryoagents are considered. The ideal cycle and cascade liquefaction, cryogenic systems with the use of throttle effect and expansion in expanders are given. Refrigeration and liquefaction systems, features of the Kapitsa and Claude cycle are considered. The process of hydrogen and helium liquefaction and air separation is considered. Microcryogenic systems and medical cryoapparation are presented.

Purpose of studying of the discipline

The study of the issues of cooling the medium to and below the level of 120 K and the study of processes and phenomena occurring in cryogenic machines and apparatuses.

Learning Outcomes

ON9 To develop innovations in heat and power engineering and cryogenic engineering.

Prerequisites

Bachelor

Postrequisites

Final examination

Methods of measurement of ionizing radiation and the properties of nuclear materials

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30282 (3010745)

Course	2
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course examines the categories of nuclear materials (NM) and the requirements for the accuracy and multiplicity of measurements. The balance of nuclear materials and the balance equation are considered. Accounting and confirming measurements of nuclear materials, non-destructive methods of nuclear materials analysis and calibration of the measuring system are given. Determination of the content of wells in samples by measuring their own gamma radiation and gamma spectrometric measurements is discussed. The fundamentals of the theory of radiation transfer and multiple scattering are given.

Purpose of studying of the discipline
Formation of knowledge and skills within the framework of the state system of accounting and control of nuclear materials.

Learning Outcomes
ON8 To justify methods for measuring emissions and material properties for modern nuclear energy.

Prerequisites
Bachelor

Postrequisites
Final examination

The research work of a student, including an internship and the implementation of a masters thesis II

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	30288 (3010753)
Course	2
Term	1
Credits count	4
The research work	120hours
Total	120hours
Knowledge control form	Total mark on practice

Short description of discipline
Research work develops the ability to independently carry out activities in the field of education and science related to solving complex professional tasks in innovative conditions, ensuring the development of professional research thinking of undergraduates, forming a clear understanding of their main professional tasks, ways to solve them, conducting bibliographic work with the involvement of modern information technologies.

Purpose of studying of the discipline
Preparation of a master`s student for independent research work aimed at writing and defending a master`s thesis.

Learning Outcomes
ON2 To form the strategy and structure of the organization of scientific research and mathematical modeling of thermal power facilities.

Prerequisites
The research work of a student, including an internship and the implementation of a master s thesis I

Postrequisites
The research work of a student, including an internship and the implementation of a masters thesis III

Fundamentals of radiation safety

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30279 (3010743)
Course	2
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course discusses the general concepts of radioactivity and the issues of ionizing radiation dosimetry. Methods and devices of

radiation control and issues of interaction of radioactive radiation with biological objects are studied. Sources of radioactive pollution of the environment and methods of protection against ionizing radiation are given. The aspects of radiation safety when working with ionizing radiation sources are discussed. Electromagnetic radiation and legal aspects of radiation safety are analyzed.

Purpose of studying of the discipline

Theoretical and practical training on radiation safety, ensuring safe operation with ionizing radiation sources, their dosimetry and control.

Learning Outcomes

ON4 To develop measures for safe operation and research on modern NPPs, engineering networks and equipment.

Prerequisites

Bachelor

Postrequisites

Final examination

Perspectives and heat physics problems of heat refrigerants technique

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30287 (3010750)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course presents the theoretical foundations of obtaining low and ultra-low temperatures. An analytical description of heat transfer processes is given. Approximate methods for solving the equations of thermal conductivity and diffusion for the conditions of heat treatment of products are considered. The basic concepts and methods of calculating the processes of cooling, freezing and defrosting of products are given. Freeze drying, cold storage and heat treatment of products are considered.

Purpose of studying of the discipline

Formation of a set of concepts in the field of low-temperature technology and high-temperature production.

Learning Outcomes

ON10 To outline the problems and prospects for the development of heating and cooling equipment.

Prerequisites

Bachelor

Postrequisites

Final examination

Systems of low temperature thermal technology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30290 (3010760)
Course	2
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is devoted to the consideration of the important role and great importance of low-temperature technology systems in various industries. The stages of development and formation of low-temperature technologies are shown. The classification of low-temperature heat technologies and the principles of constructing schemes of installations for their implementation are presented, the main and auxiliary equipment included in these schemes are described. The available methods of evaluating the efficiency and environmental friendliness of the equipment are highlighted.

Purpose of studying of the discipline

Formation of practical skills of design and operation in the field of low-temperature technology systems in various industries.

Learning Outcomes

ON9 To develop innovations in heat and power engineering and cryogenic engineering.
ON10 To outline the problems and prospects for the development of heating and cooling equipment.

Prerequisites

Bachelor

Postrequisites

Final examination

Modern methods of processing organic fuel

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30291 (3010761)
Course	2
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course covers the issues of modern methods of processing organic fuels, which are either physico-mechanical or physico-chemical, and also considers their classification according to various characteristics. The characteristics of existing raw materials and the requirements that apply to raw materials are presented. The description of obtaining important and valuable products, such as coke oven gas, coke, as a result of organic fuel processing processes is given. The issues of environmental friendliness of fuel processing processes are considered.

Purpose of studying of the discipline

Formation of skills in the field of modern methods of organic fuel processing.

Learning Outcomes

ON9 To develop innovations in heat and power engineering and cryogenic engineering.
ON10 To outline the problems and prospects for the development of heating and cooling equipment.

Prerequisites

Bachelor

Postrequisites

Final examination

Modern ways of development of nuclear energy

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30280 (3010744)
Course	2
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

In this course, nuclear fuel and heat carriers and the physical basis of obtaining thermal and electrical energy are considered. General information about the history of the development of domestic and foreign nuclear power is given. The contribution of domestic and foreign scientists to the development of nuclear energy and the use of fission energy, synthesis and other energy-intensive technologies for the production of electricity is discussed. The basic concepts of physics and design of nuclear reactors are analyzed.

Purpose of studying of the discipline

Formation of knowledge on current trends of nuclear energy development.

Learning Outcomes

ON8 To justify methods for measuring emissions and material properties for modern nuclear energy.

Prerequisites

Bachelor

Postrequisites

Final examination

Modern technologies of use of secondary energy resources

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	29926 (3010759)
Course	2
Term	1
Credits count	5

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

Short description of discipline
The discipline considers various ways and directions of using secondary energy resources as a way to energy conservation. The classification of secondary energy resources and possible directions of their application are shown. The stages of development and implementation of waste-free production technology are presented. The role of modern energy-saving measures as an energy-saving potential in heat and power production is substantiated. A detailed analysis and evaluation of the effectiveness of the use of secondary energy technology in the world is given.

Purpose of studying of the discipline
Formation of the basics of the use of secondary energy resources as the main way to energy conservation.

Learning Outcomes
ON5 To evaluate traditional and non-traditional energy conversion methods.
ON9 To develop innovations in heat and power engineering and cryogenic engineering.

Prerequisites
Bachelor

Postrequisites
Final examination

Using heat and gas refrigeration machines

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30289 (3010758)
Course	2
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Theoretical and actual cycles of gas refrigerating machines are considered in this discipline. The design of gas refrigerating machines with expanders and gas refrigerating machines with vortex tubes is given. The main provisions of the theory of thermoelectric refrigerating machines are given. The principle of operation, theoretical and actual processes of the steam ejector machine are considered. The principle of operation of the absorption refrigerating machine and the analysis of actual processes are given.

Purpose of studying of the discipline
Formation of professional competencies in the field of design, operation and installation of machines for compression and expansion of gases.

Learning Outcomes
ON10 To outline the problems and prospects for the development of heating and cooling equipment.

Prerequisites
Bachelor

Postrequisites
Final examination

Research practice

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	30294 (3010751)
Course	2
Term	2
Credits count	13
Working practice	390hours
Total	390hours
Knowledge control form	Total mark on practice

Short description of discipline
The research practice of the undergraduate is conducted in order to familiarize with the latest theoretical, methodological and technological achievements of domestic and foreign science, modern methods of scientific research, processing and interpretation of experimental data and their application in further activities.

Purpose of studying of the discipline

Formation of students` skills of conducting research work within the framework of a master`s thesis.

Learning Outcomes

ON2 To form the strategy and structure of the organization of scientific research and mathematical modeling of thermal power facilities.

Prerequisites

Basic and profile disciplines of the EP

Postrequisites

Final examination

The research work of a student, including an internship and the implementation of a masters thesis III

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	30295 (3010754)
Course	2
Term	2
Credits count	9
The research work	270hours
Total	270hours
Knowledge control form	Total mark on practice

Short description of discipline

Research work develops the ability to independently carry out activities in the field of education and science related to solving complex professional tasks in innovative conditions, ensuring the development of professional research thinking of undergraduates, forming a clear understanding of their main professional tasks, ways to solve them, conducting bibliographic work with the involvement of modern information technologies.

Purpose of studying of the discipline

Preparation of a master`s student for independent research work aimed at writing and defending a master`s thesis.

Learning Outcomes

ON2 To form the strategy and structure of the organization of scientific research and mathematical modeling of thermal power facilities.

Prerequisites

The research work of a student, including an internship and the implementation of a masters thesis II

Postrequisites

Final examination

Final assessment

Master`s dissertation

Credits count	8

4.Summary table on the scope of the educational program

«7M07101 - Heat Power Engineering»

Name of discipline	Cycle/ Component	Term	Number of credits	Total hours	Lec	SPL	LC	IWST	IWS	Knowledge control form
Sociolinguistic and scientific-pedagogical activity										
Foreign language (professional)	BS/US	1	3	90		30		20	40	Examination
History and philosophy of science	BS/US	1	5	150	15	30		35	70	Examination
Tertiary education	BS/US	1	3	90	15	15		20	40	Examination
Psychology of management	BS/US	1	3	90	15	15		20	40	Examination
Pedagogical practice	BS/US	3	6	180						Total mark on practice
Модуль 2.Organization of scientific research and mathematical modeling of heat and power facilities										
Information systems in heat power engineering and thermo technologies	BS/CCh	1	5	150	15	30		35	70	Examination
Scientific research methodology	BS/CCh	1	5	150	15	30		35	70	Examination
Organization and planning of scientific research	BS/CCh	1	5	150	15	30		35	70	Examination
Basic scientific research	BS/CCh	1	5	150	15	30		35	70	Examination
Basics of CAD low potential energy	BS/CCh	1	5	150	15	30		35	70	Examination
DBMS	BS/CCh	1	5	150	15	30		35	70	Examination
Theory and Techniques of a scientific experiment	BS/CCh	1	5	150	15	15	15	35	70	Examination
Theory and technique of heating experiment	BS/CCh	1	5	150	15	15	15	35	70	Examination
Experimental methods of physics research	BS/CCh	1	5	150	15	15	15	35	70	Examination
Модуль 3. Calculation methods of cogeneration and ventilation heat technology plants										
Alternative energy sources	AS/CCh	2	5	150	15	30		35	70	Examination
High temperature thermal technological installation	AS/CCh	2	5	150	15	30		35	70	Examination
Measurement of thermophysical properties of materials	AS/CCh	2	5	150	30	15		35	70	Examination
Methods of thermal calculation	AS/CCh	2	5	150	30	15		35	70	Examination
The research work of a student, including an internship and the implementation of a master s thesis I	AS/US	2	11	330						Total mark on practice
Scientific and technical problems in heat power engineering and thermo technologies	AS/US	2	5	150	30	15		35	70	Examination
Basics of cogeneration	AS/CCh	2	5	150	15	30		35	70	Examination
Basics of nanotechnology	AS/CCh	2	5	150	15	30		35	70	Examination
Industrial ventilation	AS/CCh	2	5	150	15	30		35	70	Examination
Modern methods of energy conversion	AS/CCh	2	5	150	15	30		35	70	Examination

Phase transformations	AS/CCh	2	5	150	30	15		35	70	Examination
Safe operation and research activities in nuclear power plants, engineering networks and equipment										
Atomic power stations	AS/CCh	3	5	150	15	30		35	70	Examination
Engineering systems, networks and equipment	AS/CCh	3	5	150	15	30		35	70	Examination
Innovative heat technologies in heat power engineering	AS/CCh	3	5	150	15	30		35	70	Examination
Cryogenic technique	AS/CCh	3	5	150	15	30		35	70	Examination
Methods of measurement of ionizing radiation and the properties of nuclear materials	AS/CCh	3	5	150	30	15		35	70	Examination
The research work of a student, including an internship and the implementation of a masters thesis II	AS/US	3	4	120						Total mark on practice
Fundamentals of radiation safety	AS/CCh	3	5	150	30	15		35	70	Examination
Perspectives and heat physics problems of heat refrigerants technique	AS/CCh	3	5	150	15	30		35	70	Examination
Systems of low temperature thermal technology	AS/CCh	3	5	150	30	15		35	70	Examination
Modern methods of processing organic fuel	AS/CCh	3	5	150	30	15		35	70	Examination
Modern ways of development of nuclear energy	AS/CCh	3	5	150	30	15		35	70	Examination
Modern technologies of use of secondary energy resources	AS/CCh	3	5	150	30	15		35	70	Examination
Using heat and gas refrigeration machines	AS/CCh	3	5	150	30	15		35	70	Examination
Research practice	AS/US	4	13	390						Total mark on practice
The research work of a student, including an internship and the implementation of a masters thesis III	AS/US	4	9	270						Total mark on practice
Final assessment										
Master`s dissertation		4	8	240						