

## The list of academic disciplines of the university component

**8D05 - Natural Sciences, Mathematics and Statistics**

(Code and classification of the field of education)

**8D053 - Physical and chemical sciences**

(Code and classification of the direction of training)

**0530**

(Code in the International Standard Classification of Education)

**D090 - D090 Physics**

(Code and classification of the educational program group)

**8D05302 - Technical Physics**

(Code and name of the educational program)

**Doctor of philosophy (PhD)**

(Level of preparation)

**set of 2023**

**Developed**

By the Academic Committee of the EP  
The head of the AC Nurymkhan G.N.  
EP Manager Kassymov A.B.

**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  
Chairwoman 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.

## Academic writing

Discipline cycle	Basic disciplines
Course	1
Credits count	5
Knowledge control form	Examination

### Short description of discipline

*The discipline covers all types of writing activities during PhD doctoral studies. Academically literate writing is an integral part of effective research activities. Important aspects of the competent writing of scientific articles, applications for grant funding, reports on research studies, and a future doctoral dissertation are considered. The choice of one or another genre of academic writing is substantiated, as well as the features of structuring, annotating, reviewing written works.*

### Purpose of studying of the discipline

*The development of lexical, grammatical, stylistic and compositional-structural knowledge and the formation of skills in the author's writing of academic texts in the framework of educational and research activities.*

### Learning Outcomes

*ON1 Use the possibilities of written communication in the academic and scientific and technical fields when writing research papers and conducting classes.*

*ON2 Interpret the results of the study and the limits of their application.*

### Learning outcomes by discipline

- substantiates his own hypothesis;
- analyzes the results obtained when writing a research paper;
- reviews scientific works.

### Prerequisites

*Masters degree course*

### Postrequisites

*Final examination*

## Research methods

Discipline cycle	Basic disciplines
Course	1
Credits count	5
Knowledge control form	Examination

### Short description of discipline

*The course examines the basic concepts necessary for conducting research work as part of a dissertation work. The main ways of obtaining and systematizing scientific knowledge are touched upon. Particular attention in the course of studying this discipline is paid to the use of existing scientific achievements for the own scientific research. Along with this, the ways of using modern information technologies, as well as the issues of interdisciplinary relations in scientific research are considered.*

### Purpose of studying of the discipline

*Improving the practical knowledge of research methods in organizing and conducting experiments, including the skills of interpreting the results obtained and presenting them in scientific works.*

### Learning Outcomes

*ON2 Interpret the results of the study and the limits of their application.*

### Learning outcomes by discipline

- assesses the state and level of research in its scientific field;
- establishes interdisciplinary interaction in modern science;
- adapts advances in science and technology for their own research.

### Prerequisites

*Masters degree course*

### Postrequisites

*Final examination*

## Thermodynamics, statistical physics

Discipline cycle	Basic disciplines
Course	1
Credits count	5
Knowledge control form	Examination

### Short description of discipline

*The course is aimed at studying the thermodynamic properties of substances from the standpoint of statistical physics. With this approach, the properties of the systems under consideration are studied as a result of the interaction of structural elements that form it. In contrast to phenomenological approach, the average result of the processes taking place at the microscopic level plays a significant role in statistical consideration. Considerable attention is paid to the mathematical apparatus for processing an array of data obtained as a result of describing the properties of microsystems.*

### Purpose of studying of the discipline

*The purpose of the course "Thermodynamics, Statistical Physics and Physical Kinetics" is to study the basic ideas and prerequisites underlying the description of random processes occurring in nature under real conditions and in real systems, which, as a rule, have an infinite number of degrees of freedom in the presence of an active external influence. environment. Preparation of PhD students for research, scientific and innovative, organizational, managerial and pedagogical activities in research institutes, higher and secondary educational institutions, laboratories, design or design bureaus, enterprises.*

### Learning Outcomes

ON3 Interpret the physical essence of the phenomena and processes of heat transfer in scientific creativity and professional activities.

### Learning outcomes by discipline

- to interpret the physical essence of the phenomena observed in equilibrium and non-equilibrium systems;
- to formulate tasks describing real phenomena in nature and technology;
- to solve problems using modern methods with the widespread use of information technologies;
- apply modern methods of collecting and processing the necessary data;
- analyze the results obtained;
- predict new phenomena on the basis of which new technologies can be created.

### Prerequisites

Masters degree course

### Postrequisites

Final examination

## Research work of the doctoral student, including internship and doctoral dissertation I

Discipline cycle	Profiling discipline
Course	1
Credits count	15
Knowledge control form	Total mark on practice

### Short description of discipline

Formulation of the topic of the doctoral dissertation and approval of the individual work plan of the doctoral student. At this stage, the relevance, scientific novelty, object and subject of research, as well as the scientific and practical significance of the dissertation work are determined.

### Purpose of studying of the discipline

Formulation and approval of the topic of a doctoral dissertation

### Learning Outcomes

ON1 Use the possibilities of written communication in the academic and scientific and technical fields when writing research papers and conducting classes.

ON2 Interpret the results of the study and the limits of their application.

ON9 Develop modern approaches to the issues of physical research using information technologies.

### Learning outcomes by discipline

- Develop innovative solutions and approaches for implementing research work.
- Solve scientific problems while working on a doctoral dissertation.
- Integrate existing knowledge with new results obtained from the research.

### Prerequisites

Research methods

### Postrequisites

Research work of the doctoral student, including internship and doctoral dissertation II

## Research work of the doctoral student, including internship and doctoral dissertation II

Discipline cycle	Profiling discipline
Course	1
Credits count	20
Knowledge control form	Total mark on practice

### Short description of discipline

Formulation of a hypothesis, which will subsequently have to be confirmed or refuted in the course of work on a doctoral dissertation. The hypothesis should be related to the topic of the dissertation.

### Purpose of studying of the discipline

Formulation of the research hypothesis

### Learning Outcomes

ON1 Use the possibilities of written communication in the academic and scientific and technical fields when writing research papers and conducting classes.

ON2 Interpret the results of the study and the limits of their application.

ON9 Develop modern approaches to the issues of physical research using information technologies.

### Learning outcomes by discipline

- Develop innovative solutions and approaches for implementing research work.
- Solve scientific problems while working on a doctoral dissertation.
- Integrate existing knowledge with new results obtained from the research.

### Prerequisites

Research work of the doctoral student, including internship and doctoral dissertation I

### Postrequisites

Research work of the doctoral student, including internship and doctoral dissertation III

## Pedagogical practice

Discipline cycle	Basic disciplines
Course	2
Credits count	10
Knowledge control form	Total mark on practice

### Short description of discipline

The pedagogical practice of the doctoral student is an important practical component of the third stage of higher education. The purpose

of teaching practice is to study the specifics of educational and methodical work and the formation of practical skills and methods of teaching in higher education

### **Purpose of studying of the discipline**

#### **Learning Outcomes**

ON1 Use the possibilities of written communication in the academic and scientific and technical fields when writing research papers and conducting classes.

#### **Learning outcomes by discipline**

- reproduce the methods and forms of conducting all types of classes
- to determine the forms and methods of control and assessment of students` knowledge
- to develop methodological developments and educational-methodical literature

#### **Prerequisites**

Masters degree course

#### **Postrequisites**

Final examination

## **Research work of the doctoral student, including internship and doctoral dissertation III**

Discipline cycle	Profiling discipline
Course	2
Credits count	20
Knowledge control form	Total mark on practice

#### **Short description of discipline**

Choice of research methods. At this stage, it is necessary to choose methods that correspond to the subject of the study. The right choice of methods will provide the researcher with the necessary material for a future doctoral dissertation.

#### **Purpose of studying of the discipline**

Determination of research methods.

#### **Learning Outcomes**

ON1 Use the possibilities of written communication in the academic and scientific and technical fields when writing research papers and conducting classes.

ON2 Interpret the results of the study and the limits of their application.

ON9 Develop modern approaches to the issues of physical research using information technologies.

#### **Learning outcomes by discipline**

- Develop innovative solutions and approaches for implementing research work.
- Solve scientific problems while working on a doctoral dissertation.
- Integrate existing knowledge with new results obtained from the research.

#### **Prerequisites**

Research work of the doctoral student, including internship and doctoral dissertation II

#### **Postrequisites**

Research work of the doctoral student, including internship and doctoral dissertation IV

## **Research work of the doctoral student, including internship and doctoral dissertation IV**

Discipline cycle	Profiling discipline
Course	2
Credits count	30
Knowledge control form	Total mark on practice

#### **Short description of discipline**

Conducting theoretical and experimental research. This stage actually represents the main part of the research, during which the doctoral student will work on the accumulation of empirical data. Correctly performed experiments determine the success of further research.

#### **Purpose of studying of the discipline**

Obtaining empirical data.

#### **Learning Outcomes**

ON1 Use the possibilities of written communication in the academic and scientific and technical fields when writing research papers and conducting classes.

ON2 Interpret the results of the study and the limits of their application.

ON9 Develop modern approaches to the issues of physical research using information technologies.

#### **Learning outcomes by discipline**

- Develop innovative solutions and approaches for implementing research work.
- Solve scientific problems while working on a doctoral dissertation.
- Integrate existing knowledge with new results obtained from the research.

#### **Prerequisites**

Research work of the doctoral student, including internship and doctoral dissertation III

#### **Postrequisites**

Research work of the doctoral student, including internship and doctoral dissertation V

## **Research practice**

Discipline cycle	Profiling discipline
Course	3
Credits count	10
Knowledge control form	Total mark on practice

### **Short description of discipline**

*The research practice of the doctoral student 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**

#### **Learning Outcomes**

*ON1 Use the possibilities of written communication in the academic and scientific and technical fields when writing research papers and conducting classes.*

*ON2 Interpret the results of the study and the limits of their application.*

#### **Learning outcomes by discipline**

*- interpret the methodology for constructing the stages of scientific research*

*- draw up a work plan when conducting research*

*- prepare reports on the work done*

#### **Prerequisites**

*Academic writing Research methods*

#### **Postrequisites**

*Final examination*

## **Research work of the doctoral student, including internship and doctoral dissertation V**

Discipline cycle	Profiling discipline
Course	3
Credits count	20
Knowledge control form	Total mark on practice

### **Short description of discipline**

*Processing and interpretation of the obtained results. Correct processing of the data obtained as a result of experimental studies will allow to give a direct answer to the goal and objectives of the study.*

### **Purpose of studying of the discipline**

*Analysis of data obtained as a result of research.*

#### **Learning Outcomes**

*ON1 Use the possibilities of written communication in the academic and scientific and technical fields when writing research papers and conducting classes.*

*ON2 Interpret the results of the study and the limits of their application.*

*ON9 Develop modern approaches to the issues of physical research using information technologies.*

#### **Learning outcomes by discipline**

*- Develop innovative solutions and approaches for implementing research work.*

*- Solve scientific problems while working on a doctoral dissertation.*

*- Integrate existing knowledge with new results obtained from the research.*

#### **Prerequisites**

*Research work of the doctoral student, including internship and doctoral dissertation IV*

#### **Postrequisites**

*Research work of the doctoral student, including internship and doctoral dissertation VI*

## **Research work of the doctoral student, including internship and doctoral dissertation VI**

Discipline cycle	Profiling discipline
Course	3
Credits count	18
Knowledge control form	Total mark on practice

### **Short description of discipline**

*Formulation of research results in a single dissertation work. At this stage, the doctoral student needs to analyze all the material received during the entire period of study and assemble it into a coherent structured document.*

### **Purpose of studying of the discipline**

*Formulation of a doctoral dissertation*

#### **Learning Outcomes**

*ON1 Use the possibilities of written communication in the academic and scientific and technical fields when writing research papers and conducting classes.*

*ON2 Interpret the results of the study and the limits of their application.*

*ON9 Develop modern approaches to the issues of physical research using information technologies.*

#### **Learning outcomes by discipline**

*- Develop innovative solutions and approaches for implementing research work.*

*- Solve scientific problems while working on a doctoral dissertation.*

*- Integrate existing knowledge with new results obtained from the research.*

#### **Prerequisites**

*Research work of the doctoral student, including internship and doctoral dissertation V*

#### **Postrequisites**

*Final examination*