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 2024

Semey 2024

Developed
By the Academic Committee of the OP
The head of the AK Kasymov Askar
OP Manager Stepanova Olga

Reviewed
At the meeting of the Commission on Academic Quality of the Faculty of Engineering and Technology
Protocol №3 15.01. 2024
At a meeting of the Academic Quality Commission of the Research School of Physical and Chemical Sciences
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Protocol No. 1 June 06, 2024

Approved
at a meeting of the University Academic Council by protocol No. 6/1 of January 19, 2024.

at a meeting of the University Academic Council by protocol No. 11 of June 28, 2024.

Statistics and experimental design using R

Discipline cycle	Basic disciplines
Course	1
Credits count	3
Knowledge control form	Examination

Short description of discipline
The course provides an in-depth study of statistical methods and principles of experimental design using the R programming language. The course examines real-world research examples, starting with descriptive statistics and ending with complex experimental designs. The course will prepare students to independently perform data analysis, design experiments and interpret the results.

Purpose of studying of the discipline
Doctoral students tudents will master modern statistical methods of data analysis and the principles of experimental design using the R programming language, which will allow them to effectively apply this knowledge in scientific research.

Learning Outcomes
ON2 Interpret the results of the study and the limits of their application.
ON7 Structure the information on the problems of thermophysics of materials in research activities.

Learning outcomes by discipline
Knowledge of basic statistical concepts and methods. The ability to use R software for statistical data analysis. Skills of independent design of experiments and interpretation of their results. The ability to use the results obtained in real scientific and applied research. Негізгі статистикалық ұғымдар мен әдістерді білу.

Prerequisites
Masters degree course

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

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.
ON6 Form a scientific approach in matters of statistical physics and thermodynamics of irreversible processes.

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

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